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GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LIV.—No. 12.
Whole No. 824.

NEW YORK, MONDAY, MARCH 23, 1891.

$3 PER ANNUM,
IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

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BRIEFLY TOLD.

SPECIAL EDITORIAL CORRESPONDENCE, OHIO ASSOCIATION.—*Zanesville, Ohio, March* 18, 1891.—It scarcely seems possible that the Ohio Association has reached the age where time and custom dictate that it shall emerge from the long clothes of infancy and babyhood to don the knickerbockers of early youth, but the years over which its life has been spread are at the requisite number. In its seventh year, to-day! Verily does the man of the hour glass and scythe go quickly on.

A bustling, bright lad, too, is the Ohio Association; and well do his knickerbockers become him, fitting him just loosely enough to convey the idea that he is anxious for the day when his sponsors will promote him to the dignity of filling a regulation pair of trousers.

March cannot be counted on with any degree of certainty to yield bright skies, calm airs and warm suns, in fact the reverse of these are usually the measure of its graces; but as the infantile exception is submitted as the best evidence of the manhood of a rule, I am more than pleased to say that we have so far enjoyed weather simply splendid. How good it is to feel the breath of spring after the reign of a winter like that which was our portion in 90–91.

Frowning Zanesville, lazily lying on the uneven, ragged banks of the now muddy Muskingum (uncertain as to whether her turbulence for the current season is at an end), brightened up under the sunshine and smiled a welcome to the gas men, who came trooping in. The Committee of Arrangements had made every advance preparation, and their work is well done. The hotel accommodations are to be sure not all that one would wish for, Mine Host of the Clarendon seemingly believing that the successful hotelkeeper is he who prospers best that rents his rooms only over the counter or when the would-be partaker of his hospitality, grip in hand, is ready to drop the latter for the purpose of inscribing his name on the register. To put it plainly, he cares not to set apart and hold rooms that have been ordered in advance, by wire or mail. The first-come-first-served principle is a simple one, of course, but it is not altogether conducive to the best comfort of those who, having traveled 500 miles or so, would like to be sure of bed and board at the end of the journey. The meeting room is all that could be desired, and the place chosen for the exhibition of gas appliances is commodious and well up to the demands that are being made upon it. Quite a creditable display of burners, stoves, etc., is assured and many visitors have inspected the collection. Mention of the exhibition recalls to mind many remarks heard to-day by prominent Ohio gas men, all to the effect that, great as was the success which attended their especial efforts last season to popularize the use of gas for cooking and heating, the success of the past will be but the entering wedge to or precursor of still more pronounced gains in this direction in the current year. Further, it seems to be the general verdict that lighting gas—illuminating gas—is and must be the cheapest and most satisfactory form of fuel gas to be delivered by gas companies to ordinary consumers.

When President Faben called the meeting to order, some 70 members and visitors greeted his opening remarks. Prominent among the Eastern guests were Messrs. C. J. R. Humphreys, Secretary of the American Association, John P. Harbison, of Hartford, and Commissioner Barker. The New York delegation was a strong one, and Philadelphia was not behindhand. The Western men were also there, as aggressive and self-

reliant as ever ; but they ought to be confident in their own "hustling" territory. President Faben, of course, was in no sense uncertain in his inaugural address, which was of the practical sort—brisk, bright and breezy. Up to the present time—evening of the first day—five excellent papers have been read and discussed, and at no time did the proceedings flag, or grow wearisome. Faben knows how to direct business, and Lieutenant Butterworth assists him in his usual style. Something of a departure in the manner of arranging the sessions was carried out this year, and it met with general approval—the fatiguing night sittings were discontinued. Thus far eight new members have been placed on the rolls, with a promise of other recruits to-morrow. In view of the foregoing it seems to be superfluous to add that the meeting is a pronounced success ; and it is so beyond a doubt.—***.

Zanesville, March 19, 1891.—The sunshine of yesterday gave place to drip and drizzle to day ; but as we have been treated frequently of late to the latter, we can manage to get along with it, just as we do with the faults of our friends. The interest in the meeting was well sustained, and the discussions on the papers were animated and entertaining. President Faben added fresh laurels to those that were heaped about him before, and to his tact much of the brilliance of the meeting is due. The officers chosen were :

President—H. Wilkiemeyer, Portsmouth.
Vice-President—C. H. Welch, Athens.
Secretary—Irvin Butterworth, Columbus.
Treasurer—Geo. H. Tayler, Warren.

Mr. F. E. Barker, of the Massachusetts Board of Gas and Electric Light Commissioners, was elected to honorary membership, and, as usual, he bore his elevation with perfect serenity. Columbus was chosen as the place for next meeting. The vote on the question of badges, as reported by the committee in charge of the ballot, stood as follows: Whole vote, 119 ; yes, 107 ; no, 12 ; Association to pay for badges was voted by 39 ; individuals to pay was voted by 69. The meeting was an excellent one.—***.

THE SAN ANTONIO MEETING.—Although no official advices have reached us respecting the recent San Antonio meeting of the Southwestern Association, we are nevertheless in position to state that the gathering was largely attended, and that the proceedings were replete with interest. The paper list as published in the official notices in the JOURNAL suffered little if any from the failure of the authors to redeem their promises, and the question box added greatly to the entertainment and instruction of the delegates. The officers chosen were : President, E. A. West, of San Antonio ; Vice-President, J. R. Cullinane, of Denison ; Secretary, C. L. Deily. Suitable memorial resolutions were passed to the memory of the late Francis Beck, of Galvestou, the first President of the Association. Messrs. W. Enfield and A. E. Judge were selected by unanimous vote to again act as the Committee on Programme; and the next meeting (1892) will be held at Galveston. Enjoyable features of the social side of the convention were the ride, on the afternoon of the first day, through the city and out to the famous old "Mission," and the banquet at the Hotel Menger. The fraternity of the Southwest are to be congratulated on the fact that the '91 meeting has settled permanently the question whether the Southwestern Association is to remain a reality, and that of itself is sufficient to repay, ten times over, for their expenditure of time, thought and money, the gentlemen whose individual efforts have caused such a result, in the face of the undoubted lukewarmness of some who could, did they elect to actively assist, have lightened the labors so unselfishly borne by the men whose shoulders feared not the pressure of the wheel of duty.

REPORT OF THE INSPECTOR OF GAS, DOMINION OF CANADA.—The annual report of the Commissioner of Inland Revenue, to the Canadian Parliament, respecting the workings of his department—to the care of which is relegated matters concerning the purity and power of gas sold in the Dominion, the accuracy of meters, etc.—for the past year, is more than ordinarily interesting. While we hope to recur again to it, and at greater length, we take the present opportunity of remarking that the inspectors visited 39 separate gas works during the year and made a total of 806 examinations of the gas supplied to determine the quality thereof. None of the localities were visited less than 5 times (Brockville and Listowel), and two places (Toronto, 104, and Montreal, 101) were visited over 100 times. Of these, only one inspection (Toronto) showed the gas to be below the Government standard, and that test was made at a time when the mercury had fallen some 40 degrees in a few hours The greatest delinquency is reported from Three Rivers, where, out of 52 separate inspections, three failures are returned. Chatham (27 inspections) had two failures, and Fredericton (11 inspections) also failed twice. The others at fault once were : Cornwall (10 inspections), St. Thomas (12 inspections), and Hamilton (12 inspections). This, remembering the swift changes in temperature that are the portion of Canadians, is little short of wonderful, and evinces the caution and fidelity that mark the daily practice of Canadian gas makers. The most striking thing about the figures, though, is the ease and readiness with which they convict the self-appointed eye-photometrists of Montreal. It has been the lot of the Montreal Company to be repeatedly assailed by the "lighting value guessers" of that city, on the ground that the gas distributed was far below the requirements of the statutes, in respect of candle power and purity; yet the Government Inspector for the District, who seems to have followed the Company pretty sharply, inasmuch as he made in the twelvemonth no less than 101 separate inspections of the gas, failed to find the Company at fault. Those who will not see are worse than blind; but we imagine the Montreal growlers will be hard set on this occasion to blink the bright testimony of the Government reports.

HE PAID OVER THE MONEY.—Writing of the above brings us to the conclusion that an appropriate companion piece is afforded in the recital of the ill fortune that overtook, the other day, a certain Philadelphia eye-photometrist, a Mr. F. M. Brooke, who in former times was found sensible enough to fill the position of President to the Philadelphia Commercial Exchange. It has been fashionable this winter in the Quaker City to decry the illuminating value of the local gas, and Mr. Brooke, in order to keep in the swim, recently asserted that the gas was "abominably bad." One of his companions ventured a feeble defense of Director Wagner's illuminating vehicle, whereupon the man with the eye gruffly remarked that he would give a certain sum of money to the Media Home for Feeble-Minded Children if, on investigation, the candle power of Philadelphia gas was not found to be lower now than in the past 20 years. The records of the official inspector were subsequently examined, when it was disclosed that in 1871 the candle power averaged 14.95, whereas so far in 1891 the average was 19.89. Mr. Brooke paid over the money ; but we may be pardoned, perhaps, for remarking that the institution benefited by his loss was not well chosen. Fitness would seem to be better served had he selected some place wherein the blind are cared for.

AT the annual meeting of the Hamilton (Ont.) Gas Company the following officers were chosen : President, F. W. Gates : Vice-President, J. Cummings ; Directors, F. W. Gates, J. Cummings, J. Eastwood, E. Martin, W. Hendrie, F. W. Fearman and John Proctor.

AT the annual meeting of the Vicksburg (Miss.) Gas Light Company, Messrs. E. S. Butts, A. C. Jeffrey, E. A. C. Carroll and C. C. Floweree were elected Directors. The latter subsequently organized by electing Mr. Butts President and Mr. J. R. Pettis Secretary.

AT last the Rochester (N. Y.) situation seems to have been simplified, and that consolidation, not only of two but of the three Companies, will be effected on a reasonable basis. At any rate, the stockholders have been notified that special meetings are to be held early in April for the purpose of "voting upon the question of sanctioning and approving an agreement made and entered into by the respective Boards of Directors of the Rochester Gas Light Company, the Citizens Gas Company, and the Municipal Gas Light Company, of the city of Rochester, under their respective corporate seals, for the consolidation of the said corporations."

The Market for Gas Securities.

The market for city gas shares was quite inactive during the week, and in the absence of purchasers or even inquiries the bid price fell off to 95½–¾, at which the opening was made to day—Friday. Equitable fell a point or two in the week, and Mutual held its own—perhaps a trifle more. Standard common is weak and lower. In Brooklyn shares no change is reported, quotations there being surprisingly well maintained. Another feature in Brooklyn lighting shares is an increase of perhaps 20 points in the two arc electric lighting companies. While these companies have never in any sense been competitors, the rumor now is that a consolidation will be effected, to be followed by a stock dividend. Chicago gas sold up during the week to 44½, but sold down again to 41¾ on reports respecting quo warranto proceedings on the part of the city. The following shares were sold at auction : 1 Consolidated, at 96¼ ; 1 Mutual, at 119 ; 3 Brooklyn, at 123½ ; 1 Metropolitan, Brooklyn, at 106¼ ; 3 Fulton-Municipal, at 133½ ; 1 Williamsburgh, at 132.

[Official Report.—Revised by the Secretary.—Concluded from page 367.]

TWENTY-FIRST ANNUAL MEETING OF NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 18 and 19, 1891.

Second Day—February 19—Morning Session.

Returning to the Question-Box.

The President—There are two questions in the box which we shall have to ask Mr. Page to answer:

"*What is the state of the ammonia market to-day; and are there prospects of a better price?*"

"*Is any foreign pitch or tar coming to this market at the present time?*"

Mr. Page—I supposed I had practically covered that ground yesterday afternoon, but possibly the gentleman who asks these questions was not then present. In a few words I will repeat what was said yesterday. First, as to ammonia: The value of ammoniacal liquor is absolutely determined by the value, first, of the sulphate of ammonia, and that in turn by the nitrates imported from Chili, which are used for the same purpose as the sulphate, namely, fertilizing. They can be laid down in the markets of the world for such a figure that for the past three years the sulphate of ammonia has not advanced much above £11 or £12 per ton in the London, Liverpool and Bristol markets, which govern the prices for the world. The present quotations are somewhat less, about £10 15s., say $52.50. Sulphate of ammonia can be laid down on this side of the water, at the London price, with freight, a duty, and small commission added, so that it is selling to-day in this market at about 3¼ cents per pound. That arbitrarily governs the price of the crude ammoniacal liquor, for the reason that the ammonia products—the aqua ammonia and anhydrous ammonia—can be produced from the sulphate. With regard to the tar, I may say I do not know of any large quantity of it being imported. Some importations have been made in order to determine the absolute cost when put in barrels, shipped, and laid down on this side. I think, though, that the results have shown that it is better to pay from $3 to $5 a barrel than to import. There have been large importations of pitch, the greater bulk of which has been used for artificial fuel making, and there have been some importations of pitch for roofing and paving purposes. There is this also to be noted about tar—that the larger part of the tar in Europe which is made where regenerative furnaces are used, is heavy, and, therefore, not useful for the purpose to which at least one third or one-half of all the tar in the United States is now used—for saturating paper; that requires the thinner tar. At the present time I presume a large proportion of tar made in this country would still be of that character, and it, therefore, carries a higher value, and is worth more. There are also various objections to the importation of tar. Few vessels will carry it. Even the Swedish vessels that are employed in the crude petroleum trade object to tar. It is also necessary to bring an entire cargo. There is a good deal of leakage. Many of the barrels are broken. I hardly anticipate, even if there were a difference of 50 cents or $1 per barrel between imported and domestic tar, that there will be any large importations from the other side. As I said yesterday, beyond any question the value of tar is to remain at the present figures, the highest it has ever reached, in this or in any other country, certainly until there is very much more coal carbonized than at present.

The President—Some member has put this question in the box:

"*We would like to ask, for information, if any of the gas engineers present who are making water gas will tell us how much trouble they have from deposits of pitch, or hard substances formed in works or mains.*"

I believe Mr. Harbison is making water gas.

Mr. Harbison—I am making water gas, but I do not have any pitch or tar in mine. We make very little tar. Although tar is a valuable residual just now, yet I think we can make more money in selling gas than we can in making tar. I have, however, recently made a sale of tar accumulated from the water gas process, very satisfactory to me, and I hope it will be to the party who bought it.

Mr. Neal—I have used the water gas process for four years, but never have had any such experience. I have had napththaline collect; in fact I always have that in the fall. I have been asked if we have had any more trouble from naphthaline since we have made water gas, and I have said that there is no difference. I cannot see the slightest difference whether making coal gas or water gas.

Mr. Harbison—I have been making water gas since early in October, in connection with coal gas, and I have not in a single case, within my knowledge, been troubled with naphthaline in that time.

Mr. Jones—My opinion is that the vaporization of oil previous to injecting it into the retort or generator prevents in large measure the formation of pitch in the hydraulic main.

Mr. Dye—We have made water gas for the last 10 years, but have had no trouble with naphthaline in our mains.

Mr. Sherman—A few weeks ago I met Mr. Addicks, who told me that he expected to get $1.25 per barrel for tar from water gas works where he used Lima oil. Mr. Greenough is here, and I would like to ask him if that expectation has been realized.

Mr. Greenough—I do not know anything about it.

Mr. Shelton—I know where water gas tar has been sold for about $3 per barrel. I have looked the matter up, and find that we are getting some six cents per gallon for water gas tar. That is where we are using the crude Lima oil.

Mr. Harbison—Mr. Smith, of New Hartford, has had a little experience with water gas, and we would like to hear from him.

Mr. R. R. Smith—I feel almost out of place in an Association like this, as in our gas plant, which is a very small one, we make gas only for our cotton mill. I commenced to make gas in 1877 in a small gas works, and have gone through the different processes of resin, coal, and oil, and finally have arrived at what is known as the Flannery process, and have had it in operation some 10 years. The gas works constitute but a small part of our business, and yet it has been one of the most annoying things that I have had to take care of in the whole corporation. A few days ago we had an explosion which it may perhaps interest you gentlemen to know about. It seems that the foundation of the building was built out in the river, then inside of the foundation, and around the outside, was filled in with coarse rock, cobble stones, and gravel. We had been making gas for a good many years, everything had gone on quietly, and we had had no explosion worth noticing, when, one day, the windows went out of our retort house, and the cement flooring came up in places, and of course out came the workmen, and there was a general consternation. I was sent for, but of course I did not dare approach the works. I put a guard around them to keep everyone away. Every little while we would hear these explosions. Everybody looked to me for an explanation; but I was the most ignorant one of the whole number. I kept everybody away from the gas works for about two days. Fortunately we happened to have enough gas in our holder to carry us through that time. Even after the two days, whenever we would go near that building we would hear those volcanic explosions. This is the explanation: It seems that one of our men who had charge of the pump drips, instead of taking the the drip and throwing it out into the river, as he always had done formerly, had found a hole in the cement floor, and it was much easier for him to let the naphtha go down through the cement floor. It settled all around under the foundation of this building. Accidentally I found that the gas came up and followed a long line of pipes through the cement, and up into the generator. It made lively times for us. I have but little practical experience in the manufacture of gas, although I have had charge of these gas works for many years. A year ago I thought perhaps I would learn something by joining this Association, and I am happy to say I have found the meetings, both last year and this, to be very interesting. Last year Mr. Addicks was here with his vaporizer. I thought it would be a good thing, and being somewhat acquainted with Mr. Addicks I asked him to send us one. We put it in. The experience we have had with that vaporizer, from the beginning until now, would fill a book. Our works are small, and Mr. Addicks could not give us any instructions, but he sent a photograph of how he had it arranged in his Boston works—put up perpendicularly on the wall. Our naphtha tank was not high enough to let the oil through into the generator, and, therefore, we had trouble. I got a small tank in the generator room, and raised that up higher. Even then it did not work. We took it outside of the building and set it on the roof, but then it did not work. We took the vaporizer, put it horizontally back of our generator and covered it carefully with hair felting. If you could see the difference in our gas, before and after that vaporizer got to working in good shape, you would think that we would feel amply paid for all the experience we had in setting it going. I can say that to-day in our gas works, by or with the vaporizer as it is working now, we are making a beautiful gas, our works are going on quietly, and we have no annoyance or trouble whatsoever.

The President—The next question is—

"*What experience have members had with the Welsbach incandescent burner?*"

Can Mr. Tarbell give his experience?

Mr. Tarbell—The only experience I have had has been for about three weeks past, at South Framingham, where they are making a fuel gas. So far it has worked satisfactorily, giving an elegant light. The burners that we have are about 40 candles, although rated at 50. We have about 150 in use so far. As far as the durability of the mantle is concerned, I am not yet prepared to give any information.

Mr. Stiness—Do those burners throw off much heat?

Mr. Tarbell—There is some heat, of course; but I do not think it is noticeable. I do not think that it would warm up the atmosphere in a room any more than the same amount of illuminating gas.

Mr. Greenough—I have a Welsbach burner on my library table. It gives the brightest light I ever saw from a gas burner. It uses about 5 feet of gas, and gives a light of about 45 candles. The first mantle that I had did not last a week, but the second one has lasted well. I am delighted with it, although I am not sure that it is good for my eyes. Some think it is the finest light they ever saw, and others think the light is too strong; but by shading it at the bottom and top we get it about right. We are using a number of them at our office, and I am trying them with ordinary coal gas. I do not feel at all sure that they do not meet a wide demand. With regard to their use with fuel gas, I think it is a question how long the mantles will stand the heat. We have been experimenting with them somewhat with pure fuel gas. They certainly give a beautiful light when they start, but the light is materially diminished after using. They have made a very marked advance recently with regard to these burners.

Mr. Stiness—I would like to ask Mr. Greenough if he gets the best results from a low candle power gas, or from a rich gas.

Mr. Greenough—You would have to burn more fuel gas to get the same quantity of light.

Mr. Allyn—Perhaps Mr. Greenough would state the present price of the mantles. I understand that the price has been considerably reduced.

Mr. Greenough—I cannot say exactly; I think they cost 50 cents, but I am not sure.

The President—The next question is—

"*What is the best way to sell incandescent light—by meter or by guessing?*"

Mr. Stiness—I have been in the electric light business now for some time, and I think there is a great deal in that question. It is a question which those in the electric light business have to face. I think that in the matter of selling incandescent light, from the starting point up to within a very short time, the quantity has been arrived at by guessing at it; but the question has to be met in a different way and in a different form. I judge from my experience that when they get to selling incandescent light by meter the general cry of the managers of electric light companies will be that good old hymn, "They Are After Me."

Mr. Lamson—I do not pretend to know anything about electric lights, although I have been studying the subject somewhat for a year, but when you come to talk about meters for the electric light, I am reminded of a little experience that I think may interest you. As I say, I have been studying the matter somewhat, and I have very grave doubts about the accuracy of any electric light meter. During the summer I have had something to do with the electric light company in Worcester, and supposed that we were going to have some control of it. A little while ago, in fact within a fortnight, I was asked in Worcester to go to the electric light station to look at some electric meters. They had them all set up. The cases were taken off so that I could see the machinery in them and the way of working. A great many incandescent lights were put on—it was a large circuit and a great many were lighted in the station. I was asked to get up on the platform and examine the meters. To prove how accurate they were, they showed me how they were going with all the burners on, and then they would show me how they would lessen down as the lights were shut off. As I say, a great many lights were put on. There were two meters, both moving. The man who was showing them off said, "Now we will shut off so many burners, and you will see how this will slow down." So he shut off a lot of burners. "Now," said he, "you see how it slows down." But I didn't see. Then said he, "Shut off so many more." And they shut off so many more. Then said he, "Do you see any difference?" I said that I must acknowledge that I did not. "Well," says he, "shut off so many more." And they shut them off. "Now do you see any difference?" No; I don't. "Then shut them all off." So they shut them all off, and then I began to see that the thing began to slow down. There was a difference in the meter between when the lights were all going and when none were going, but practically the shutting off of twenty or more incandescent lights did not seem to very materially affect the meters.

Mr. Neal—I do not know but it is perfectly legitimate to answer any of the questions which have been asked. I know where a meter is put into a place where the consumer has been using the light freely, measuring it by contract or by guessing, the consumption runs down very remarkably after the meter is put in. As a director of one of the electric light companies, pure and simple, I had a little difficulty with a party who refused to pay his bill. He had been buying his electricity by contract, and had lighted up his whole building with it. He was a printer and publisher. He used the light very freely. But the moment the meter was put on he cut down his lights, and only used two or three. That would probably be the general effect of introducing a meter. Much less machinery would be required at the central stations to furnish consumers if meters were used. I remember when I was in Bradford, Pa., with our friends and the delegation from the New England Association, I noticed they burned the street lights (using natural gas) all the time. I asked the manager of the company why that was. He replied it cost more to put the lights out than it did to let the gas burn. He said they did not meter the gas that was used in houses at all, that they were getting to use too much, and that the gas was wasted. When they could get better prices they would use the meter. And so it is with the electric light. I think the companies might be better off if there was not so much current sent out.

Mr. Jones—Then, according to your view, the electric companies are not getting money enough for what they are selling.

Mr. Neal—I think I know of one company that is not—a pure and simple electric company.

Mr. Lansden—This question is a very interesting one. Although not in the electric light business myself, I have noticed, in passing down the streets in Washington, on Sunday morning, that many stores using the electric light leave their lights burning all of Sunday. I also noticed them lit in the evening much earlier than they would light up when they were using gas. Further, everyone that I have heard from thus far, when electric meters were put in, gave up the electric light, after the first month, and came back to gas. There was the same trouble when the gas meter was first introduced. The people fought it exactly as they will the electric light meter. It is the same old story. Whenever you put a check on them they will begin to take care of the light.

Mr. Harbison—I recommend everybody engaged in the electric light business to use meters, and particularly those who are engaged in the business in our cities. I recommend them to use meters in every case.

Mr. Stiness—So say I.

Mr. Taber—I did not expect to say anything before this Association about electricity this year. You are going to the office of the Gas Appliances Company this noon to see the improved Welsbach burner, and afterwards you are going to the Thomson-Houston works. Would it not be better to carry this discussion over into the Thomson-Houston shops this afternoon, and examine the meters there? I shall take particular pains to see that Mr. Lamson will have a chance to find out whether a meter does stop or not. It is possible the old adage is true—that no one is so deaf as he who will not hear. I do not wish to say anything more than simply to add we all know of course that electric meters, whether it be the Edison, the Westinghouse or the Thomson-Houston, are in a state of youthful nativity, and are yet to be developed. That they do go around, as I have seen gas meters go around, and that they have all the faults of the gas meter, I have no doubt whatever. I only hope public judgment will be suspended until they have had time to get as old as this Association is—to grow out of their teens into maturity.

Mr. Lamson—I shall be pleased to be shown an electric meter that is good for something. I told this story about testing meters rather in a joking way. I believe the amount of intelligence and experimental research being brought to bear upon these electrical matters will eventually develop a meter that will correctly measure the electric current; but I certainly do not believe any meter exists to-day that can do it. I believe any company which puts much money into the electric meters of the present day will find that those meters will be useless in a very few years.

The President—Of course it is but proper we should have our fun at the expense of the electric light meter, as every one has been making fun at the expense of the gas meter in years gone by. I think if you all go down to the Thomson-Houston factory this afternoon and go about with Mr. Lamson's recommendation in mind, have both eyes open and take in the whole business, you will come back with a very much better and clearer idea of what the future is going to be than you have now. Our time is getting short. We have two questions left that are quite similar:

"*Won't water gas give more candle power in a flat-flame burner?*"

"*What burner is best suited to use for a mixture of coal and water gas by general consumers?*"

I will ask Mr. Lansden to answer those questions.

Mr. Lansden—I have the misfortune to be compelled to test my gas by a 15-hole Argand burner, such as was thrown away years ago in New England when the 24-hole burners were adopted. We are required to send out 16-candle gas tested by this 15-hole Argand burner. The burner that Mr. Love uses in New York for testing water gas is a No. 7 Bray. Mr. Love gives me a certificate that the gas tested there by two different burners shows a difference of 6½ to 7-candle power. When in Washington last fall, he went to the laboratory of the government inspector, and they put the same burner on, and it had the same effect here. For water gas there is no standard, of course, adopted in the country. The flat-flame burner I think is the only one that will give anything like satisfactory results. A mixed gas is what I am fighting for. I don't want straight water gas. I am making a candle power which, on the Bray burner, gives me 26 candles every day; but that is not in my estimation as satisfactory as a candle power which will be 23 by being half water gas and half coal gas. I think the most satisfactory results in the photometer will be obtained from the flat-flame burner which is being now used in every large city where they are making water gas or mixed gases.

Mr. Greenough—I do not want to have that assertion made without having something said in opposition to it (otherwise it might be said that the New England Association had indorsed that view), because in the water gas with which I am familiar here we certainly have got better results with the Argand burner than we have been able to get with the flat-flame burner—not the small Argand, but one of the larger sizes.

Mr. Lamson—I think there is no question but that we will get better tests by the burner used by the State Inspector than with the flat flame burner; and it is the very reason that we can get better results by the use of that burner which led the State Inspector to suggest the flat-flame for the test. Perhaps I did not make it clear yesterday when I spoke of the intention of the State Inspector. He thinks you should test with a burner that is in common use. He don't care if they lower the standard from 15 candles to 12 candles, or whatever it might be. The old claim of the Boston Gas Company was always that gas should be tested with the burner that was best adapted to it; and it seems to me that that is a perfectly just claim.

Mr. Lansden—The gas companies made this fight when they first introduced water gas into New York city, and they undertook to test it by a 15-hole Argand burner. They got the law changed in New York for the water gas companies, so as to allow the Inspector to use the burner best fitted to the gas.

The President—If Mr. Shelton were not so good natured I would not call on him again to give his experience in testing gas with the flat-flame and with the Argand burner.

Mr. Shelton—I am sorry I cannot give the detailed information that I would like to. Personally I had but little experience in photometric work. I know that our best results certainly come from flat-flame burners. From the experience that we have had we think the ordinary batwing burner is the one for testing candle power. I think the burner should be used which is to the best advantage of the gas that is to be tested. If we are using oil gas we want to use a burner best adapted to oil gas, and when we use water gas we want to test it with a burner which will give the best results from water gas; but, at the same time, it should be the burner that the consumers use—the burner in common use. We find, as far as the burners in common use go, we furnish hundreds and thousands of the ordinary batwing lava jet; it is the most common burner in use for coal and water gas. We have used it for testing our candle power, and we get results which are entirely satisfactory as to the candle power, and which I think are correct.

Votes of Thanks.

The President—There are no other questions before us. Any general business is now in order, preparatory to closing this session.

Mr. Harbison—We are drawing very near the closing minutes of this session of our annual gathering, but before closing I think it is due to the Association that we put ourselves on record. I know, Mr. President, from personal experience (having had the honor of serving two years in the chair, which you have so ably filled during the past year), of the responsibility and duties devolving upon the Secretary of this Association; and I know how much of the success of these annual gatherings is due to his efforts. I know I voice the sentiments of the members of this Association when I say I believe that our annual gatherings of the New England Association have been of as much real benefit to the members of the fraternity as have been the annual gatherings of any other gas association; and we all know that that result is largely due to the incessant efforts of our Secretary, Mr. Nettleton, who retires from that position at the close of this session. He has been diligent, in season and out of season. He has been always faithful during the many years he has served this Association. He has always, with one exception (and then he was necessarily absent), been in attendance at these meetings; ever courteous and obliging, and ever ready to give us information not only during the sessions, but during the balance of the year. I think, before we close, it is due to ourselves that we put on record a vote of thanks in expression of our appreciation of his services. I therefore move that the thanks of this Association be tendered to Charles H. Nettleton, our retiring Secretary and Treasurer, for his very faithful services during the long term in which he has served us in that capacity.

Mr. Greenough—I second the motion.

The President—It gives me very great pleasure to put the motion of Mr. Harbison—that the sincere thanks of this Association be tendered to Charles H. Nettleton for the able and satisfactory manner in which he has served this Association as Secretary and Treasurer during the past six years. Those in favor of the motion will manifest it by rising. It is a unanimous vote. Mr. Nettleton has the thanks of the Association.

Secretary Nettleton—Mr. President and Gentlemen: Of course I can but thank you for the kind words that have been said, and for the kind manner in which they have been received, for your vote of thanks. I do sincerely thank you. It is perhaps needless to say that I have taken pleasure in working for the Association; and it is a matter of fact that I have felt a great deal of interest in the work, and so far as it depended on me I have tried to make the Association the greatest success that it was possible to make it. I trust you do think that the Association has prospered during the past six years, and that, in some measure at least, Mr. Harbison's words are not entirely an exaggeration. I know that as time goes on one of my pleasantest recollections will be that which is connected with the Secretaryship of this Association and my occupancy of the position. (Applause.)

Mr. Lamson—Gentlemen, when this meeting closes the time of service of the present President expires, and the Association will be in charge of another man. Before the session closes I want to move a hearty vote of thanks to President Prichard for his careful management of the affairs of the Association for the past year, and for the courteous and efficient manner in which he has presided at the present meeting. As I sat here this morning and looked at the President and Secretary, and thought of the change to be made, I thought how fortunate we had been at this meeting of the Association in having had a President who conducted the meeting in a quiet and easy manner, without any extra fuss or feathers, but nevertheless in an intelligent manner, and for the best interests of the Association. And our Secretary has learned to run the affairs of the Association in a very smooth manner, so that no time has been lost. We have been kept to the discussion of the subjects in hand, without branching into outside matters. It is a great pleasure to think that while our President goes out from the chair, he will go into the other chair, of the retiring Secretary; and I fully believe he is a man fitted for that position. I have no doubt that, while we shall miss our present Secretary, who has served us so well, yet the affairs of the Association will go on practically just as well as they have—and they certainly cannot go much better—but practically as well in the years to come. I move a hearty vote of thanks to the retiring President for his faithful care of the Association, and for his admirable conduct of the proceedings of the present meeting.

The motion was put by Mr. Allyn, President-elect, and unanimously adopted by a standing vote.

The President—Gentlemen, in return for the kind words you have said with regard to my humble efforts in carrying on this meeting, consistent with the broadest and best results, I wish to return my thanks to you for the close attention you have given, and for your perfect willingness to answer the calls made upon you. I know I have intruded on some of you, but it was in the interest of the Association, and in that interest you must forgive it. I appreciate your kindness and thank you most sincerely for your attention.

As there is no other business before us, the 21st session of the New England Association is closed.

IN MEMORIAM.

General Charles Roome.

The Committee appointed to prepare a memorial of our late honorary member, General Charles Roome, respectfully submit the following:

General Charles Roome was born in the city of New York, on the 4th of August, 1812, and died in the city of his birth, June 28, 1890, in the 78th year of his age.

He was elected an honorary member of this Association, at the annual meeting, held in Boston, on the 21st day of February, 1877, and was the first on the list of honorary members of the Association.

In his relation to the gas industry General Roome stood first and foremost as to length of time in service, and his whole career has been marked by conspicuous ability in whatever position he has been called to act. His name was familiar and respected, not only throughout his own country but all over the world wherever the business of manufacturing gas has been established. His eulogy has been spoken and written throughout the land, but we pause for a moment, as time flies swiftly by, and place upon our record this simple memento of one whose removal from us leaves a vacancy which can never be wholly filled, whose honorable record excites our profound respect and will always remain as worthy of being emulated by all the members of the profession.

A. B. Slater,
Fred S. Benson,
J. P. Harbison. } Committee.

J. Henri Rollins.

In the death of J. Henri Rollins the New England Association of Gas Engineers has lost a member who will be much missed for his kindly disposition, the genial enthusiasm of his manner and his sterling honesty of purpose. Those who visited him at his office or home will long remember the cordial greeting he had for all who had any claim on his attention. His hospitality was unbounded. The younger members of our Association found in him a trusted friend. Gifted to an unusual degree with sound common sense, his counsel on all questions connected with the management of gas works was valuable and freely given. Many a new beginner could thank him for advice and suggestions that not only enabled him to retain his position, but to make a success in after life. In the battle of life, did a brother gas engineer fall, he was always ready with advice, and pecuniary aid if needed, to put him on his feet again. Another's need was his opportunity to do a kind act, to speak a kind and cheering word. While a strict disciplinarian in the management of his employees, still, if any of them were sick or in trouble from any cause, they knew he was ever ready to help them. He interested himself in their welfare, and in as far as they followed his advice they were sober, industrious and frugal workmen.

His first experience in the gas business was with the Boston Gas Company. He left their employ to go to Cairo, Ills., where he helped build the works. In 1870 he went to Minneapolis, Minn., to construct the works, and afterwards was employed by the Minneapolis Company as Engineer and Manager. In 1875 he was elected Engineer and Agent of the Worcester (Mass.) Gas Company, where he remained till sickness compelled him to resign his labors and cares in order to recover his lost strength. After resigning he lived one year, most of the time an intense sufferer. He bore his three years of weakness and suffering with great patience. His services were highly appreciated by the Companies he served. He was retained by the Worcester Gas Company two years during his sickness in the hope that he would recover his health. His funeral was attended, June 23, by a large gathering of members of this Association.

F. C. Sherman,
F. J. Davis,
H. A. Allyn, } Committee.

Nathaniel Tufts.

The Committee appointed to prepare a memorial of our late associate member, Nathaniel Tufts, respectfully report as follows:

Nathaniel Tufts was born in Malden, Mass., October 28, 1824. As an apprentice to his father he learned the trade of tinsmith.

At the completion of his apprenticeship he was employed by James Darracott, the first agent of the Boston Gas Light Company, to work on gas meters. Afterwards he became Superintendent of the Boston Meter Company, and served in that capacity until 1858.

In the year 1860, the firm of Tufts, Cheever & Co. was established for the manufacture of lanterns, gas meters and other gas appliances. In 1862 Mr. Cheever withdrew from the firm, and it continued under the name of Tufts Brothers until 1878, when Mr. Tufts became sole proprietor, and continued in business until his death, which was caused by an accident at his home, November 9, 1890.

Mr. Tufts was well known as a man of sterling integrity. He was quiet and unassuming in his manner, and gained the respect and affection of all who knew him.

He was possessed of great skill in his business, and produced work which will remain as a constant reminder of an earnest, upright, conscientious man.

Mr. Tufts was held in high regard and will be sadly missed by the gas fraternity.

George B. Neal.
Edward C. Jones,
George D. Bill. } Committee.

Inaugural Address of President Paterson, Manchester District Institution of Gas Engineers.

Gentlemen—Just twenty-one years ago, ten gentlemen intimately connected with our industry met in this great city. The primary object of that meeting was to present a token of respect and to bid an affectionate farewell to one we all know, one we all respect and honor—Thomas Newbigging. It is recorded in gas history that Mr. Newbigging left our shores for Pernambuco early in 1870; and it is also known that he has long since returned to us from that distant land, and that the force of his presence permeates throughout our system. To sum up, Newbigging is, so to speak, a medium through which we pass in the pursuit of our career. As the seed-bud of the Manchester District Institution of Gas Engineers was discovered on the occasion mentioned, I think it will be of interest to members generally to give here the record of the first proceedings on Feb. 26, 1870. Therefore I cannot do better than quote the words written at the first meeting:

"After the business of the presentation a unanimity of feeling was expressed by the gas engineers present as to the desirability of their being enabled to meet more often together for an interchange of thought, and to discuss any matter appertaining to gas manufacture and distribution. The gentlemen present at this meeting formed themselves into a Provisional Committee to establish 'An Association of Gas Engineers' to be held in Manchester, to be comprised of gas engineers and managers of gas works situated within a certain radius of Manchester. The following is a list of names and officers of the gentlemen present at the meeting, and appointed to establish the Association: Joseph Wood, Chairman; Wm. Longworth, Secretary (pro tem.); Harrison Veevers, Robert Dempster, Isaac Kelsall, Wm. Smith, Wm. Blackledge, John Booth, James Braddock, David Brandwood. The Secretary was requested to draw up a circular stating the object of the Association, and to forward a copy of the same to each of the neighboring gas engineers or managers. The name proposed to be given to the Association to be determined upon at a future meeting; but for the present, and until alteration, the Association shall be styled 'The Manchester District Association of Gas Engineers.' The first general meeting to take place immediately after the replies to the circular have been submitted to the Provisional Committee."

The foregoing is a complete extract of the business transacted by the Provisional Committee at their first meeting. On March 12, 1870, they again met to consider the replies received by the Secretary; and it appears that twenty gentlemen wrote, signifying their intention to join the new Association. Rules were drawn up at this meeting, to be submitted for approval at a general meeting; and the Secretary was instructed to forward a copy to each member. The first general meeting was called on the 26th of March, when the report of the Provisional Committee was read and adopted. At this stage the "ship" had, it may be said, fairly left the builder's yard, and was under way; therefore I will not detain you much longer on matters of history. But before proceeding to other subjects of moment and of recent date, it is well to note two important resolutions carried at subsequent meetings. At a quarterly meeting held on Aug. 25, 1877, a resolution to the following effect was adopted: "That in future the title of this Society shall be known as 'The Manchester District Institution of Gas Engineers.'" A still more important change was made at the annual meeting held on Feb. 23, 1878, when it was resolved—"That the Institution shall consist of resident engineers or managers of gas works in the employ of gas companies or corporations, and of gas engineers solely employed as consulting engineers, and not engaged as agents for any trading or manufacturing firm." The nature and power of the latter resolution is peculiarly significant at the present time; and our lasting thanks are due to Mr. Harrison Veevers for bringing forward such a resolution, and carrying it to a successful issue.

Now, gentlemen, I have cordially to thank you for the honor you have been pleased to confer upon me in electing me to the office of President of your Institution in the twenty-first year of its existence. I am but a young man in the ranks of the profession; and there are many who have a prior claim to that honor, and who are better fitted, from their longer experience, to guide the discussions of these meetings. The Institution has been distinguished from time to time by the valuable addresses of its Presidents, and the no less valuable papers of its members, which have proved in many instances not only of general interest to the profession, but also of public benefit. The prosperity of the Institution up to the present time has been very satisfatory. The roll of membership has steadily increased; and at the present time the number is 92. Notwithstanding this, the question has often occurred to myself and to others: Are we deriving the fullest possible benefit or value

from the power of the Institution? To my mind, we are not. By examining the Board of Trade returns, it will be found that we represent about £10,000,000 sterling of capital employed in our various undertakings; and although with that money we manufacture light, it must be admitted that we are ourselves in semi, if not in utter darkness in many respects, and are simply feeling our way. Cannot, therefore, the forces of the Institution make an advance still further, and grapple with important debatable subjects in a more practical and exhaustive manner than any one individual member can be expected to do? It is no doubt true that we are unable, with our present finances, to enter upon a thorough system of theoretical and practical experiment to clear away the mystic "ifs" and "whys" which present themselves; and it may fairly be said that it is not incumbent upon us to do so. Should we, however, resolve to institute inquiries from time to time on concrete subjects, where is the "inevitable" to come from? I say, without reserve, that it should come from the companies and the corporations under which we serve, as they must directly benefit from the inquiries instituted. The total cost for experts would be the amount paid for their services, plus printing, and less received for sales of results to other undertakings throughout the country, and I may say throughout the world. Should these results be of a searching and thorough character, the income on the sales would go largely towards balancing the account. I do not propose that boards and committees should be asked to contribute an annual fee to the Institution; far from it. My object is to take up a given subject at any time, and, if possible, exhaust it; the cost of the inquiry being borne by the undertakings on the books of the Institution. Take as an example petroleum oil as an enricher of gas. What a comfort it would be at the present time, to those who are struggling under heavy cannel prices, if they could commence with confidence to use oil as a substitute, in a scientific and at the same time practical manner. Standard data on many points are required; and I believe much might be obtained somewhat in the way suggested. There is another point I may mention here, and that is the issuing of monthly or quarterly returns, giving the current prices of secondary products obtained by the members. Such information I believe would prove useful, both when received and afterwards for a reference.

In preparing an annual address, one naturally first tries to discover what is our position to-day; and, when this is done, to place it in a progress-balance against our position last year, and note the gain or loss. To-day it is not my intention to inflict upon you such minute acts of cruelty, but rather to take a casual glance along the line of events of the past year.

It may be said that in most manufactories the price of raw material governs, to a large extent, the balance of profit on the undertaking; and in a gas manufactory no exception can be taken to the rule. Coal and cannel must be bought, and gas produced under all circumstances and at all times, whether it is produced at coal famine rates or the reverse. There has been a steady advance in the price of coal since 1888. At that time the pit price for Arley Mine coal was 6s. 9d. a ton; and in 1890 had advanced to 9s. 10d. for the same class of gas coal—showing an increase of 45 per cent. These advances, we all know, are chiefly due to disturbing influences emanating from an unknown value—viz., the fair labor and fair pay of a collier. There appears to be no indication of a fall in prices, although some authorities think a decline will come before long. It is therefore beyond our power to do more in these matters than trust to good firms to put us on their most favored terms when obtaining tenders.

With regard to residuals, we stand more in the position of colliery proprietors, inasmuch as we have something to sell; but even here we do not always obtain a fair market value. As an instance, last year a corporation invited tenders for tar. Three offers only were received; and the highest tender was 23s. 6d. per ton. Whether or not this price represented the market value, I leave each gentleman to judge; but I certainly am of opinion that it did not. In bygone times it was frequently urged that gas undertakings should proceed no further than the manufacture of gas, and should dispose of all their raw residuals. Gradually sulphate of ammonia forced its way forward; and at the present time a large percentage of gas works carry on this branch of industry, and at a handsome profit compared with the old system. Tar distillation has made less progress, due probably to the process being somewhat dangerous, and more complicated in its manipulation than the treatment of ammoniacal liquor. But it may be asked, Why multiply tar distilleries? Is it not quite possible and perfectly reasonable to say, Let companies and corporations within a given area join together and erect large works and send their tar to be manufactured, sharing the profits according to the tonnage of the tar sent in. With respect to the tar and ammonia products, there have been no changes of importance in the prices of these during the year, although I suppose manufacturers have a balance in their favor, notwithstanding a decline in the price of sulphate of ammonia.

Now for a few minutes let us consider some of the most important questions uppermost in the minds of gas engineers and managers in the conduct of their various works. Inventions and schemes come so rapidly into view in these days of high pressure that our time scarcely admits of even a casual examination of the merits or demerits of a large number of them; but there are some which, when looked into, have a more lasting effect—tending to make us go back again and again, to think over or work out an idea. One such discovery is that of Mr. Claus, where he takes up an impurity in gas and applies it in such a way as practically to remove all other impurities usually extracted by lime and oxide of iron. Assuming that this process can be successfully mastered, and moulded into practical shape, we, when making coal contracts, practically buy all the materials necessary for producing and preparing the gas for the consumer. Since Mr. Charles Hunt contributed to The Gas Institute, in 1886, his valuable paper on this subject, giving, as he did, minute details of the long series of experiments conducted at the Windsor Street Gas Works, Birmingham, the Belfast Gas Department have tried the system on a large scale. As the experiments on which Mr. Stelfox is engaged are not yet completed, we are not in a position to form any estimate of the value of the process.

We have also before us, in active operation, the system of purification in which the use of oxygen plays a most important part. Mr. Valon, of Ramsgate, to whom we are indebted for the earliest information on the subject, states that by the proper use of oxygen—*i.e.*, using 0.1 per cent. in volume of oxygen for every 100 grains of sulphureted hydrogen per 100 cubic feet of gas, or 1 cubic foot of oxygen for every 1,000 grains—he is able to remove all the sulphureted hydrogen and carbonic acid, and reduce the sulphur compounds to 6 or 8 grains per 100 cubic feet of purified gas. Mr. Valon also claims for this process a very much reduced lime bill, as no less than 1,000,000 cubic feet of gas have been dealt with by the use of only two cubic yards of lime. These figures point to a large saving in new plant; and in those works where the plant is becoming overtaxed, a ready relief is offered by trying the oxygen process. In illuminating power, a rise of 5 per cent. on coal gas is stated to result. It would interest those members who manufacture 20-candle gas to know whether or not this 5 per cent. holds good. Altogether, the inception of this process seems to be soundly based, and to carry with it a stamp of genuineness. Mr. Belton, of Shrewsbury, speaks favorably of the process, though he expects to obtain still better results.

The new discoveries in purification which I have briefly noticed have each concentrated in them a worth which must prove beneficial in the end; so that if, in gaining that end, although the first costs are large, the results should be measured not only by economies, but also by the value of total abolition of nuisances which in some towns have at times resulted in serious litigations.

In connection with manufacture we have the Dinsmore invention. It is now well known to all that the Dinsmore Company lay claim to the discovery of a process whereby they are able to manufacture from 20 to 21-candle gas without the aid of expensive cannels to attain this high quality. This subject has had a fair share of attention from men possessing the highest abilities in matters appertaining to gas; but, notwithstanding the fact that searching examinations and tests have been made by these gentlemen from time to time, there is undoubtedly something yet unexplained and undiscovered in the process, otherwise uniformity of success would obtain to a greater degree. I believe the same success attends the working at Widnes as heretofore; therefore all that can be said is that Mr. Isaac Carr must have discovered the missing link.

In continuing the important subject of carbureting poor gases, it must not be forgotten that the cannel coal beds in England are now being worked exceedingly heavily. The tendency during the past 20 years has been to increase the illuminating power of gas beyond the normal amount yielded by the best gas producing coal; thus necessitating a general use of cannel. It appears that the primary cannel of Wigan King coal is largely exhausted. The cannel of the Wigan four-feet coal has only been worked for a limited period, as its value was not known until it was examined by my father in 1876. But since that date supplies have been extensively drawn; and as the area of this deposit is comparatively small, we cannot expect a very lengthened supply. The curley cannel of North Wales can only be obtained in minute quantities in comparison with the demand. Yorkshire and Derbyshire, we are told, are still rich in cannels; but in both cases cannels of the first order are absent—the beds consisting of what may be termed second-class cannels. To prevent any possible misunderstanding regarding this statement, let

it be understood that what I mean by "first order" is the cannel of the Wigan four-feet coal, or a similar quality. In Scotland several of the old standard seams have disappeared, and others are being increasingly drawn upon from year to year. The owners of cannels are no strangers to the limited supply, and hence the excessive prices to which they have been advanced; and one of the problems of the day is to find a substitute.

Mr. Frank Livesey and other gentlemen have turned their attention to oil as an enricher of coal gas; and for this they deserve the thanks of the profession. It is not my intention to make many remarks upon this interesting subject, or to exhaust your patience further than to refer briefly to one or two points. Mr. Livesey's experiments show that by using a mixture of gasoline and crude spirit of naphtha, in about equal parts, he could, by vaporizing with steam, raise 1,000 cubic feet of gas from 16 to 17 candles, at a cost of 1½d. to 2½d. for oil; giving a net cost of 1¾d. after deducting ¼d. for the value of the gas made from the oil. To obtain the same results by the use of cannel, he found the relative cost to be nearly 2½d.; thereby showing a saving to the extent of ¾d. in favor of oil. It appears that during the experiments a trial was also made to prove whether or not the vapor carried by the gas was of a permanent character; and, in order to determine the matter, a quantity of coal gas was raised two candles and allowed to stand for five days, when, upon testing, it was found to be of practically the same illuminating power. These experiments are valuable, inasmuch as they tell us at once that we are not entirely dependent upon colleries for cannel. They, however, only introduce the subject to us in a businesslike manner; and it now rests with ourselves to proceed further on the lines indicated by Mr. Livesey in his experiments, or as practice may otherwise lead us. Professor Lewes has placed a store of information within our reach upon the subject of oils; and I doubt not that he will be largely drawn upon in our pursuit for a good substitute for cannel.

Then, again, it may be said that this question of oil is nearly allied to water gas. Upon this I only wish to say a few words. Although we hear a good deal about water gas in this country, it has, with slight exceptions, only so far amounted to talk. But when we read statistics of what is done, and is being done, across the Atlantic in the supply of water gas—statistics that show a wonderful growth within a few years—it certainly suggests to our minds the question whether we shall not be justified before long in putting down, at least partially, water gas plant as an auxiliary to our ordinary plant in mid-winter. Large volumes of gas can be produced and carbureted within a small area; and in a gas works, where incandescent coke is ever at hand, a generator could at any time be put into full operation within a few hours. In this manner it appears to me that we could carburet with cheap petroleum, and, by afterwards passing the gas through a superheater, produce a cheap, and at least a brilliant gas to help us out of a temporary and possibly a serious difficulty. The cost of petroleum, upon which the light depends, must inevitably be much greater here than in the country which produces it; but on the other hand, our economical means of producing the gas must, to a considerable extent, tell upon the cost price in the holder. Another leading feature to be kept in view in these times of labor troubles is our position. Would it not be very much strengthened at the weakest and most important part of the year if we were in a position to start a water gas plant?

As we are discussing the producing section of a gas works, let us look for a few moments into our retort houses, and note the change of to-day as compared with 10 or 20 years ago. If it is a moderately large house, we shall probably find smart work going on with our friend West's hand-stoking machinery. Note the condition of the men. They appear less fatigued, happier, and more capable of executing their work; and I am constrained to say that the working expenses, as given to me by a gas engineer well known to all of us, go to substantiate the observations I have noted down from time to time. With regard to power-stoking machinery, I can speak from past experience that the saving in fatigue to the men employed was very marked; but the saving in respect of the corporation was also very marked—and I may say generally marked on the wrong side of the ledger. Now, however, we witness a different condition of affairs. Wherever a retort house contains (say) from 130 to 150 mouthpieces in a range, together with fairly regular work throughout the year, very clear advantages accrue from the adoption of power machinery; and it may also be said, without contradiction, that modern retort house interiors wherein machinery is used contain a steadier class of men, who present an appearance less like Robinson Crusoe than those "in the old time before them." The results of labor disputes, among stokers especially, during the past two years have certainly armed us with arguments which certainly did not before exist in favor of machinery. These labor troubles have also brought into being the novel idea of placing retorts on an inclined plane. How far this change in the retort house is going to place us beyond dependence on skilled stokers has yet to be determined; but the results so far are encouraging in many respects. Regenerative settings are another great improvement introduced within late years. This subject is one of the most important that we have to deal with, and in itself presents materials for an address, without touching any other branches of our profession. For this reason I do not intend to detain you with any arguments of mine, beyond saying that during the past six years I have had regenerators attached to settings wherever possible.

New departures from what might be termed accepted necessities in the construction of gas holders have also been taken. It is now proved beyond doubt that it is not absolutely necessary, for the safety of a holder, to erect columns or standards of any description. Practical proof of this is to be found in Manchester, where a third lift has been added on the wire rope principle, the invention of Mr. Pease, to a gasholder 100 feet in diameter. And at Haslingden a two-lift gasholder 80 feet 9 inches in diameter was erected in 1889 on the same principle. The reports received regarding the working of these holders are most satisfactory. At Northwich a telescopic holder, erected upon the principle discovered by Mr. W. Gadd, has been in daily action for upwards of 12 months. In this case the guidance and rigidity of the vessels are maintained from the bottom curbs. Mr. Mellor, our Secretary, reports that, under all conditions of weather, the holder has worked equally well, and has not caused him any anxiety whatever. Judging from examples already existing, there is good evidence to warrant at least 30 per cent. reduction in future in the cost of holders.

Before concluding, it may be of interest to mention a few facts concerning the progress made in Birkenhead relative to gas stoves. This branch of our business was commenced in June, 1883; and it was intimated to all consumers that sample cooking and heating stoves and utensils could be seen and full particulars obtained in the show room at the Gas and Water Office, where a number of stoves and fires were connected. Up to 1884, comparatively few cooking stoves had been let out, although a fair business had been done in gas fires. In March, 1885, a gas exhibition was held in a hall in the town. Lectures were delivered by Mrs. Thwaites and Mr. T. Fletcher; and the advantages of using gas for cooking and heating purposes were brought prominently under the notice of the townspeople. The result was very satisfactory; and a demand arose for stoves which has since been more than maintained. At the close of our financial year in March last we had 320 stoves out on simple hire, 210 on hire purchase, 160 for which the hire purchase had been completed, and 70 sold outright—in all, 760 stoves; and 550 gas fires had also been sold during the same period. The usual opposition from townspeople, supported by some members of the governing body, had to be met. The conditions of sale, etc., are as follows: Gas fires are sold at 25 per cent. profit; time and materials for fixing charged at cost price. Cooking stoves are sold outright at 22 per cent. profit; time and materials for fixing included in the price, which will rather more than cover the cost. Stoves on the hire purchase system are charged at cost price, with a margin for time and materials for fixing according to size; 2½ per cent. per annum charged for repairs during the period of hire, with interest at 4 per cent. on the balance at the end of each year of hire. Stoves are let out on simple hire at a rent equal to 12½ per cent. per annum on the cost of the stove and materials; and as we write off 10 per cent. per annum depreciation, and charge to the stove account the cost of fixing, removing, and repairing, this branch is worked at an apparent loss. As a set-off, there is the indirect profit on the sale of gas; and the stoves will eventually stand in our stock account at a nominal value. The hire purchase stipulates that the amount agreed upon shall be paid by 20 equal quarterly installments; and the hirer undertakes not to remove the stove, or allow it to be removed, during the period of hire without the consent (in writing) of the Corporation. If default is made in the quarterly installments for a period of six months, the Corporation, in addition to any other remedy they have, are at liberty to enter and resume full possession of the stove upon giving 24 hours' notice. The hire system has answered very well in Birkenhead. The majority of the stoves are let to occupiers of houses rented at from £20 to £40 per annum. There is very little difficulty in the collection of accounts; and business with this class of consumer is worth cultivating.

The following is an estimate of profit now made per annum owing to the increased sale of gas for cooking and heating purposes:

760 cooking stoves, at 20s. each per annum	£760
550 gas fires, at 10s. each per annum	275
	£1,035

Brought forward		£1,035
Deduct interest on stock, £1,929 at 4 per cent....	£77	
Loss on stove account (including £66 attendant's wages)	111	
	—	188
		£847

This is exclusive of grillers, boiling-burners, etc. The day consumption on the two summer quarters before the introduction of stoves amounted to 10 per cent. of the whole; and it now represents 16 per cent. On the two winter quarters, the day consumption was formerly 26 per cent. of the whole ; and now it is about 30 per cent.

Now, gentlemen, a few remarks about the electric light, and I will close. Some time ago, Mr. Alfred Clough, the Manager of the Liverpool Electric Supply Company, kindly accompanied me over the various electric stations now in operation in Liverpool, and explained in a general way the plant and working. The system in use in Liverpool is a direct current continuous supply at a pressure of 110 volts. There are three systems now at work, containing plant capable of serving 15,500 16-candle power lamps ; and the Company are at present supplying about 12,000 lights. The engines in use are Willans's central valve compound, with cylinders 14 and 20 inches in diameter and with 9 inch stroke, capable of indicating 180 horse power. Ten are of the above size, and three with cylinders 10 and 14 inches in diameter, and with a 6-inch stroke, indicating 60 horse power. The framework of the engines is constructed so as to form a complete chamber all but air-tight, and inside a supply of water and castor oil is always provided. This is churned up by the movement of the cranks, and effectually lubricates the internal bearings. The dynamos have magnets of the single inverted horseshoe type, with massive wrought iron limbs. The armature shafts are coupled directly on the crank shafts of the engines. The battery of accumulators at each station is capable of supplying 500 lights at a time ; thus enabling the machinery to be stopped at from 10 to 12 o'clock at night, and in some cases entirely on Sundays. The accumulators are charged during the daytime. All the distributing mains of the Company are laid underground. The largest feeding mains are composed of 91 No. 9 wires, and have a sectional area of 1.57 square inches. The conductor is covered with two layers of jute yarn and boiled in refined bitumen. It is next wrapped with parchment tape and covered with a lead casing. The lead is protected by an outside covering of rough jute yarn treated with asphalt and tar. The ordinary feeders are made of 61 No. 11 wires, having an area of 0.6 of a square inch, and the distributers of 37 No. 13 wires, ¼ square inch in area. The service lines to the consumers' premises are made of 19 No. 14 wires, insulated and covered with lead pipe. The length of frontage, along which distributing mains are laid, is 9¼ miles. The total length of single cable throughout the area is 41 miles, and the weight of copper employed in the mains is 210 tons. The light is generally used in offices, banks, hotels, etc., and in a fair number of shops ; the latter taking it mostly for window decoration—thus leaving the main lighting of the premises to be done by gas.

These few particulars regarding electricity in Liverpool bring my remarks to a close. I very much fear that the task allotted to me has been fulfilled in a very indifferent manner—that many interesting subjects have been entirely ignored, while others have been simply skimmed over. Of all this, I am only too well aware.

Petroleum Wealth of Russia.

M. B. Prilejaiev, writing in the *Economiste Russe*, says that the development which from year to year is seen in the production of mineral oil in Russia, the increased exports abroad and the competition on foreign markets with American products, and, finally, the fears that have recently been expressed as to the probability of an approaching exhaustion of the sources of petroleum in the Caucasus, invest with a particular interest this important branch of Russian industry. The following is a summary of the progress effected, and the present condition of the petroleum trade. The extraction of naphtha is confined almost exclusively to the Caucasus, in the peninsula of Apcheron, and principally in the environs of Baku. The existence of petroleum in the Caucasian soil was known at a very early period, and when these districts were still under Persian rule the government made concessions to private individuals of the right of working the petroleum beds. After the annexation of Baku to Russia this industry was at first a monopoly, which brought into the treasury, from 1821 to 1872, an annual revenue of 87,000 roubles. After the suppression of this monopoly in 1872 an excise duty was imposed which was removed in 1877, and had yielded a total sum of 1,218,789 roubles. The yield from this source to the imperial exchequer in 1888 was nearly 7,000,000 roubles, and in 1889 over 9,000,000. From 1832 to 1862 the production of naphtha in the Caucasus was confined within narrow limits. During this period it varied from 255,500 pouds to 358,300 pouds annually (the poud is equivalent to 36 lbs. avoirdupois). From 1863 to 1868 it rose to between 538,900 and 998,900 pouds, and continued to rise until it amounted to 1,685,229 pouds in 1869, the year from which its enormous development dates. In 1870 the production amounted to 1,704,465 pouds ; in 1875, to 6,285,728 ; in 1880, to 20,736,949 ; in 1885, to 115,000,000; and in 1889, to 206,897,100 pouds. The environs of Baku supplied about 99 per cent. of the Caucasian production; in round numbers they yielded 165,000,000 pouds in 1887 ; 190,000,000 pouds in 1888 ; and 205,000,000 in 1889. The producing districts are situated at a certain distance from the town, on the plateaux of Balakhani, Sabountchi and Sourakhani towards the northeast, and in the Bibi-Eibat fields which are to the southeast of Baku. In the Baku basin there were 216 wells in working in 1887, and 239 in 1888. The quantity of naphtha carried from the wells to the distilleries amounted to 186,220,470 pouds in 1889, and from January 1st to August 1st of 1890 it amounted to 138,782,688 pouds (against 99,930,712 pouds for the corresponding period of the preceding year). Professor Mendeliev estimates the daily production of the Baku district as follows : In 1886, 328,890 pouds ; in 1887, 415,000 pouds ; and in 1888, 503,120 pouds. The Balakhani and Sabountchi fields are the most important. In the former there were 216 wells in 1885, and in the latter 128. In 1887 the number of wells in both districts in full working amounted to 201, with a product of 153,246,672 pouds ; and in 1888 they amounted to 227, giving a yield of 176,332,226 pouds. The average annual yield for each well was 762,421 pouds in 1887, and 776,794 pouds in 1888, an increase for the latter year of 2 per cent. The principal companies engaged in the extraction of petroleum are the Nobel, Caspian, Baku, Caspian and Black Sea, Schibaiev Mirzoev, Dembo and Cohan, and Zaturov and Arafelov Companies at Balakhani, Sabountchi, Taguiev and Sarkissov, and the Djakeli Companies at Bibi-Eibat. The petroleum extracted from the wells is carried by pipes to the large stations or reservoirs, and thence distributed in the same manner to the works. This system was inaugurated in 1877.

The quantity of raw petroleum delivered to the works by the Baku Companies amounted to 153,122,049 pouds in 1888, 186,220,476 pouds in 1889, and 192,044,202 pouds during the period comprised between the 1st January and the 1st November, 1890. The distilleries are, for the most part, established at Baku, where they form a special district, which is known as the "black town." In this district there were 145 distilleries in 1887, which treated nearly 142,000,000 pouds of naphtha, and produced 38,000,000 pouds of refined petroleum (kerosene), 1,800,000 pouds of lubricating oil, and 40,000,000 pouds of residues, besides a considerable quantity of benzine, vaseline, and products of secondary importance. In 1889 the number of distilleries was 147, and their total product amounted to 181,590,232 pouds, of which 62,000,000 were light oils, 1,000,000 heavy oils, and 113,000,000 residues.

Independently of the Baku basin, naphtha wells are found in other regions of the empire. In the environs of Tiflis naphtha is found in the neighborhood of Signakh, and at Naftlough. In 1887 there were 85 wells, which yielded 28,660 pouds of naphtha. In 1889 the Signakh, wells alone furnished 55,296 pouds ; that is, more than 17,000 pouds than the preceding year. In the Government of Elisasetpol the production was only 2,000 pouds in 1888, and 3,000 pouds in 1889 ; in Daghestan it was 3,350 pouds in 1888, and 3,955 in 1889 ; in the province of Terek, 161,442 pouds in 1888, and 275,721 pouds in 1889. The wells of the province of Kouban are of greater importance. The following will show the distribution by districts of the petroleum refineries and their relative production in 1889 :—Transcaucasia, 148 refineries, with a production of 158,259,869 pouds ; St. Petersburg and Moscow, 35, and 1,515,559 pouds ; Central regions, 8, and 1,480,208 pouds ; Southern 6, and 944,689 pouds ; Western, 2, and 324,215 pouds ; Baltic provinces, 1, and 317,427 pouds ; Northern, 1, and 15,719 pouds ; Southwestern, 1, and 1,799 pouds ; and Poland, 1, with a product of 511 pouds ; making, in the aggregate, 203 refineries, with a yield of 162,859,996 pouds.

The working of petroleum at Baku is placed under the direction of a committee of experts, established in 1886. The greater part of the petroleum extracted is consumed in the interior of the empire. The petroleum is carried from Baku by the Caspian Sea, then by the Volga to Tsaritsyne. From this place a certain quantity goes up the river, but the greater part is carried by rail, in tank wagons, to all parts of European Russia. The Nobel Company owns the largest amount of material for the transport of petroleum ; in 1889 their vessels represented a value of nearly 6,000,000 of roubles, and their tank wagons 3,000,000 ; the wagons belonging to the Caspian and Black Sea Company

represented a value of 448,773 roubles. The Naphtha Company owns 2,310 tank wagons; the Schibaiev, 305, and the Caspian Company, 200. These companies also own reservoirs in the principal cities of the empire. Petroleum intended for foreign markets is shipped chiefly from the port of Batoum. The export keeps pace with the development of the petroleum industry. The importance of lighting oils in this export is accentuated from year to year. In 1883, refined petroleum only represented 41 per cent. of the total exports; the following years the proportion amounted respectively to 57 per cent., 67 per cent., 61 per cent., 62 per cent., 78 per cent., to attain the figure of 84 per cent. in 1890. In the year 1889 over 6,000,000 pouds of lighting oils and benzine were exported from Russia to the United Kingdom; 4,000,000 to Austria; 3,000,000 to Germany; 2,000,000 to Italy; 2,000,000 to Belgium; and smaller quantities to Holland, Roumania, Spain, Denmark, Sweden, Norway, Greece, France, etc. Turkey took in the same year 7,000,000 pouds; East Indies, 5,000,000; China, over 1,000,000; Persia, 336,000; and Japan 330,000 pouds of lighting oils and benzine. In 1888, 77 per cent. of the total exports were effected via Batoum, and in 1889, 80 per cent. M. Prilejaiev concludes by quoting the opinion of Professor Mendeliev to the effect that there is no indication of an approaching failure of the petroleum supply of the Baku basin, leaving out of the question the other districts of Russia which still await the development of their naphtha wealth.

The Electric Arc.

Prof. Elihu Thomson, in his interesting paper (read at the recent meeting of the National Electric Light Association), on "The Electric Arc and its Use in Lighting," says:

The arc proper is composed of a stream of vapor arising from the actual boiling or vaporization of the solid or fused ends of the separated conductors. In so far as the surrounding air mixes or combines with this vapor stream, it is modified by the presence of oxygen and nitrogen; but the air, or any other gas, is not essential to be present, and is merely incidental to the formation of the true arc stream in air. Indeed, it may seem strange to some to speak of vapor of carbon, copper, iron, platinum, etc., but their production is merely a question of temperature in any case. In the electric arc there is a real distillation of the conductors forming it, and this accounts for the variation of color and temperature to be found in different arcs. The copper arc evolves a peculiar green light, which is exceedingly trying to the eyes, as those who have experienced its effects well know. Zinc gives a whitish blue, while the carbon arc proper is purplish in tint.

It appears to be the positive pole which gives out the vapor stream. With carbon the positive vaporizes steadily, and is consumed much faster than the negative. In the use of the arc, however, for lighting, we have learned to distinguish between what is called a "short-arc" and a "long-arc" system. In short-arc systems the carbons are burned much nearer together than in the long-arc systems. Let us suppose the case of two carbons touching each other with a current passing, and then that we very slowly separate them, stopping to obseve the effects. When the contact is light, before actual separation, a visible heating of the meeting ends is seen. On attaining a small separation the space between seems filled with a hot vapor, and we have a short arc where the separation is perhaps not over two to three one-hundredths of an inch. There is also noted an active transfer of carbon from the flattened end of the positive, and a deposition of carbon on the end of the negative.

This deposited carbon takes the form of a mushroom end after a time and breaks off. Meanwhile combustion goes on at both poles and wears away the sides of the positive carbon, while the transfer of carbon wears away its tip or crater. The burning also wears away the negative at the sides, while the tip is built up from the mushroom deposit from the arc. But the cutting in of the negative finally severs the mushroom tip and it falls away. Hence both carbons are eventually consumed. To develop a short arc there is required a little over half the potential that is needed for a long arc, or about 25 volts, more or less; and therefore to give out equal heat energy in the arc, the current must be doubled in the short arc over what it would be in the long arc. The short arc is subject to the objection of a continual frying sound emitted, and great variations of luminosity; it requires a very dense and hard carbon to conduct the current without great loss, and involves the loss of at least four times the amount with the long arc if equal gauge wires be used.

In fact, while in the past such arcs were common, their number is diminishing, as they are being replaced by the more efficient and completely developed arcs called "long arcs," which are so-called to distinguish them from the "short arcs." Returning to our separating carbons, we find that as the space or arc is lengthened from the short arc condition we pass a stage of great flickering and unsteadiness and a fluctuating potential between the carbons, and then reach the stage of production of the long or quiet arc. With 10 amperes the separation may now be about $\frac{1}{16}$ to $\frac{1}{8}$ inch or more. Smaller currents require less separation and larger ones an increased separation. At this stage the arc is quiet, with good, pure carbons very steady, and the potential difference remains at about 45 volts, if, of course, the carbon is properly fed to make up for combustion. The perfect arc is really a beautiful phenomenon. While the positive carbon still loses by volatilization from its tip or crater and by combustion from its sides, the negative gains no deposit, but wastes at a less rate than the other, and by combustion only. The carbon vapor carried off from the positive is consumed by the oxygen of the air before it can deposit on the negative. Hence, the outer zone of flame, which can easily be distinguished from the central zone or arc flux proper, is probably a zone of combustion similar to that in ordinary flames.

The arc Light an Incandescent Light.—The removal of carbon by evaporation from the positive end gives rise to the crater or cup which is so prominent a feature of carbon arcs produced by continuous currents. The size or area of the crater is a rough measure of current strength, but varies with different qualities of carbon. With very long arcs the crater or hollowed end disappears and the ends become rounded. A well formed crater with the arc or flame confined thereto means usually a steady light, since the chief source of light in an electric arc is from the positive crater, which shines like a diminutive sun and represents the hottest part or the arc. The vapor light proper or flame light is comparatively very feeble and of a purple quality in air. Hence the arc light is as truly an incandescent source of light as is the incandescent carbon filament, with the difference that to run the latter at a temperature of evaporization or boiling point of carbon, so to speak, means instant destruction, while by the necessities of the case the light obtained from the arc is chiefly that emitted from a surface of carbon at its temperature of boiling, or more correctly, of sublimation at atmospheric pressures. This temperature is exceedingly high, and accounts for the well-known superior economy in light production of the arc over all kinds of lighting. The temperature of the positive carbon crater is so high that the carbon exists there in a soft or plastic condition capable of receiving an impression like putty. I have proved this with very large arcs of 150 to 200 amperes by suddenly forcing the carbons together when the current had been cut off, and finding that they would fit each other perfectly, the negative impressing its form on the positive crater.

As an interesting fact in this connection I may state that I have been able to bend carbon sticks of $\frac{3}{16}$ to $\frac{1}{4}$ inch in diameter by passing current through them of sufficient amount to almost vaporize the sticks and cause them to emit an intensity of light approaching that of the arc. These facts would point to the possible fusion of carbon into liquid carbon at arc temperature under a high pressure of inert gas. No one has as yet seen carbon in this liquid condition, and the electric arc alone has made us acquainted with carbon vapor. One cannot fail to be impressed with the fact that the conveyance of carbon in the arc has a striking resemblance to a plating process where metal is taken up by the bath from the positive plate and deposited on the negative. In the arc the hot vapor stream or flame takes the part of the bath, and probably acts by molecular interchanges of carbon atoms in molecules of carbon to cause the transfer which occurs, just as in the plating bath the molecules of the plating compound are polarized and allowed atomic interchange which results in conveyance of metal through the bath.

Another curious fact in relation to the arc is the distribution of potential in it. Dr. J. A. Fleming has recently shown that the difference of potential between the positive carbon and the arc flame is about 40 volts, and the few volts which express the difference between the flame and the negative make up the total potential, say 45 volts. Hence the real work of the arc is not in the flame; the energy is not used in overcoming flame resistance, but chiefly in vaporizing carbon in the positive crater. It is certainly not strange that with 40 volts, and, say 10 amperes or 400 watts, expended virtually at the crater surface of the positive carbon, the temperature and luminous effects should there be so great.

When arcs are operated on by alternating currents, the effects mentioned are only partially exhibited, and the phenomena of the crater are, of course, masked or obliterated on account of reversal of function of the carbons. Unless the alternations are rapid, such arcs are liable to extinction at the zero points of current, particularly when run in a draft of air. A strong draft of air or displacing magnetic field may, of course, so disturb an arc as to cause its extinguishment. In the early years of the growth of arc lighting as a means of illumination the effects obtained were not of the best. Unsteadiness was the rule, and it

required much persistent effort to discover the causes and find the remedy.

Defects of the Arc Light.—The prominent defects were, and, we may add, are still, hissing, sputtering, flaming and general unsteadiness. Hissing or frying comes, of course, with too short an arc, and may be connected with too vigorous vaporization. They may also be due in some cases to a carbon of too coarse a grain. Sputtering may arise from impurities in the carbons, and flaming from too long arcs, from impure carbons, or from carbons insufficiently baked and containing unexpelled gases.

Running an arc at a length between the long arc condition and the short arc condition may cause great unsteadiness of light. There is, in fact, a critical point in the length below which there is a considerable fall of luminosity, and a drop of nearly one-third of potential. As an arc lengthens by combustion of its carbons, beginning below this critical point, great unsteadiness will be manifest on arriving at the critical state, and a little longer arc brings about a sudden and very marked increase of potential, of illumination and steadiness.

Any observer may easily detect these conditions without special effort. The earlier carbons used with arc lamps in the United States were both badly conducting, impure and badly made. Copper coating was a necessity. French or Carre carbons were much better, but were too costly to import. The use of the petroleum carbon, or the carbon obtained by the carbonization of the tarry residue left in the distillation of crude oil, made a wonderful difference in the purity of the carbons, and improved machinery gave accuracy of form and cheapness. To one familiar with the former cost of carbons for battery arcs the reductions in cost are very striking.

Another important matter in relation to carbons is that the size of section or diameter must be proportioned to the current used. Where attempts have been made to prolong the hours of burning of a carbon by enlarging its diameter beyond certain limits, they have resulted in injury to the character and distribution of the light. Large diameters of carbon may burn too blunt to let the light out between them. Likewise, where attempts have been made to prolong the hours of use by employing a harder or denser carbon than before, it has frequently been found that a sacrifice of light has been incurred, rendering the results much less satisfactory. One of the chief obstacles to the employment of quite small arcs with currents of three or four amperes is the difficulty of obtaining suitably uniform carbons. Arcs of even as low as 2 amperes at 45 volts are easily produced, and such small arcs might even have commercial utility if the difficulties in relation to carbons were removed. An arc consuming 90 to 100 watts means, of course, about 7 or 8 to the electrical horse power.

On the other hand, very large or heavy current arcs are difficult to control. They are apt to be unstable at times, and when they get to hissing, or rather roaring, it is difficult to restore quietness and steady action. The introduction of cored carbons for the positive has, however, done much to remedy the difficulty, and indeed to render it possible to obtain very uniform results from arcs in general wherever such results are indispensable. The introduction of the central soft core into the carbon seems to locate the arc centrally, hold it from fluttering or shifting its position on the end of the positive; in other words, the core fixes the position of the crater and so benefits the light.

Although in ordinary cases an arc is formed by a single pair of electrodes or carbons, and by a single circuit current, compound arcs, or arcs produced by combinations of two or more currents with three or more electrodes, are possible. I am not aware that any others than myself have experimented in this direction. I have, however, produced lights with two positives and one negative, with one positive carbon or crater and two, three or more negatives, and with two positives and two negatives. I have caused arcs to cross each other, as when four carbons are used, pointing toward a center, the two pairs opposite being respectively connected with different circuits. In this way direct arcs have been, as it were, mixed with alternating arcs, and a curious compound effect produced by crossing two arcs made with two alternating currents, the wans of which are displaced in phase.

THE Aluminum Carbon Company has purchased a plot of ground at Lancaster (10 miles east of Buffalo, N. Y.), and will at once construct buildings and equip them with machinery for the manufacture of electric light carbons. The works are to be equal to turning out 40,000 carbons per day, and it is said that they will be in operation by June 15th. The Company is capitalized in $40,000, and the officers are: President, Andrew Cant; Vice-President, R. J. Getz; Secretary and Treasurer, F. V. Doty; Superintendent, W. H. Boulton.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

JAMES W. REA, a disgruntled stockholder in the San Jose (Cal.) Light and Power Company, has brought suit against the Directors, asking that they be compelled to return to its treasury certain sums of money expended in channels "foreign to the purposes of the corporation, and in contravention of law," etc. To put it in another way, Rea claims that the Directors have caused "the corporation to take an active interest in politics," and that they have been paying a monthly subsidy to a local newspaper—the *Times*. Complainant claims that during the last city election the corporation expended several hundred dollars on behalf of certain candidates, and also avers that a large sum was paid out for attorney's fees and costs in a litigation conducted by one of the Directors in his individual capacity. Mr. Rea has certainly managed to compile an odd complaint against the Directors, but compilation is far from proof; and it is beyond doubt that the persons whom he thus accuses are men prominent and in good standing in San Jose. They in return ridicule Rea's charges, deny them in toto, and court the fullest trial.

WE understand that Messrs. Taintor & Holt, of this city, who have been the nominal owners of the Fort Madison (Iowa) gas works, have sold the same to Messrs. Coffin & Stanton, also of this city The latter have been largely interested in the Fort Madison water works for some time back, and Colonel W. J. McCray, who has charge of the water system, will also assume direction of the gas works.

"I READ in your last issue an item respecting the incorporation of the Athol (Mass.) Gas and Electric Company, with a capital of $25,000, and forward you the following outline of the purpose and scope of the new Company. It is a Company formed by the controlling interests that owned the Miller's River Gas Company and the Athol Electric Light and Power Company, the properties of both of which are under foreclosure, by the International Trust Company, Trustee. The latter has ordered a sale of the same to be held on Friday next, and the new Company will undoubtedly be the purchaser. The electric lighting contract with the town (to run for 3 years, from May 17, 1888) will shortly expire, and I have an idea that it never was an unmixed blessing to the contractors, although fairly good prices are received. Those are about as follows: 2,000-candle arcs (23 in number), running from dark to midnight, at $75 each per annum; 32-candle incandescents (19 in number), on same burning table, at $15 each. I believe that something like $12,000 was expended in the electric installation, and as the residents never gave the electricians much encouragement in the way of using the lights (either arc or incandescent), it is not hard to comprehend why the Company failed to make a go of the electric business. Nevertheless, the local authority is anxious to put in a plant on municipal account, and it is to be hoped they will see the error of such a course before the order is given. The new Company, I understand, proposes to start out right in the matter of capitalization, since it is virtually agreed that the $25,000 will stand for the capital of both the gas and electric divisions—the bonded obligations on the gas property alone amount to almost $44,000. In addition to the officers named in your item of a week ago, I may say that the Directors are Messrs. G. C. Moses, I. H. Bickford and F. R. Davis.—OBSERVER."

THE plant and franchises of the Morris (Ills.) Electric Light Company were offered recently at sheriff's sale, and bid in by Mr. O. D. Nelson, brother of Superintendent Nelson, of the Morris Gas Company.

THE Troy Gas Company has entered into a contract with the Troy (N. Y.) Contracting Board under which it agrees to maintain the gas lamps outside of the electric lighting district, at the rate of 8 cents per lamp per night—about 180 gas lamps are still in use in the city. The Company also agreed to light the City Hall with gas, at the rate of $1.50 per 1,000.

THE following official wail from the Mayor of Utica, N. Y., over the cost of the city lighting, will not be uninteresting: "The electric light commission, on Nov. 19, 1888, reported to the Common Council that there had been 365 lamps placed, and said: 'We believe there will be necessity for but few additional lamps, provided those we have can be made to burn steadily and continuously.' On Feb. 1, 1889, the commission reported 368 lamps as nightly burning. This contract having expired on Dec. 31, 1890, your honorable body entered into a contract with the Utica Electric Light Company for the same number of lights as under the old contract, with 33 additional lights when located by the Mayor and Board of Aldermen. I desire to call the attention of your

Board to the fact that since the year 1885, as per the following table, there has not been on the average a sufficient amount of money raised by tax to pay the yearly expense of street lighting:

Year.	Amount Levied by Tax.	Amount Expended.
1885	$45,000	$66,541 84
1886	48,000	48,057 29
1887	48,000	45,565 59
1888	42,000	42,861 33
1889	43,000	43,873 54
1890	50,000	46,912 86
Total	$276,000	$293,812 45

From this table it appears that the amount expended for street lighting, over and above the amount raised by taxation, is $17,812.45. Although $50,000 was levied in September last, yet on the 1st of February of this year the city was obliged to issue a temporary loan bond for the January bill of the Utica Electric Light Company, and we shall be compelled to continue borrowing until the proceeds of the tax levy of 1891 are available. This will create a deficiency, if the present number of lights are continued, by October 1, 1891, of about $27,349, and if the 33 additional lights are located it will amount to nearly $30,000. In other words, the amount of the tax to be levied in 1891 for street lighting purposes, in order to avoid the paying of interest on temporary loans and to provide funds to pay monthly bills from one tax levy to the next, should be about $80,000. In view of the large amount required to be inserted in the next tax levy for street lighting purposes, and also from the fact that the city is now better lighted than any other city of our State, I most earnestly hope that your honorable body will agree with me that for the present the onerous burdens now resting upon our people shall not be augmented by the location of additional lights. It should be remembered that this contract is for the term of three years, and that if the maximum number of lamps are now located a new contract will be necessary to meet the exigencies of the future. The Rutgers street viaduct, the Genessee street bridge, if rebuilt, and the new territory on the north, if annexed, cannot be safely left in darkness."

At the annual meeting of the stockholders in the Nashville (Tenn.) Gas Light Company the following Directors were elected: Samuel Prichitt. T. D. Craighead, S. M. Murphy, Thomas Plater, Van L. Kirkman, James Simmons, and M. M. Gardner.

The Alton (Ills.) Gas and Electric Light Company will expend $25,000 in the installation of an electric lighting plant.

Mrs. McFadden recently sued the Pacific Gas Improvement Company for damages in $50,000 on account of the death of her daughter, Mrs. Mary Belt, who was accidentally asphyxiated by gas at her residence, 408 Hyde street, San Francisco, Cal. The case was tried before a jury, and plaintiff's evidence was directed to proving that deceased came to her death through inhaling gas that escaped from a defective gas heater rented from the Gas Company. It was also asserted that one of the Company's agents called at the house shortly before Mrs. Belt died—she lingered for some days after the alleged discovery that she had been poisoned by gas—and offered her $300 to sign an agreement releasing the Company from responsibility in respect to her injuries. The Company presented testimony supporting the conclusion that Mrs. Belt was in poor health at the time she leased the gas stove, and that her death was neither occasioned nor hastened from inhaling gas. The jury disagreed, the final ballot standing 6 to 6.

At a recent meeting of the Gas Committee, Allegheny City (Pa.) Councils, a petition was received from Philip Hamburger, a resident of Fayette street, who asked that his house be supplied with incandescent electric lighting from the wires of the municipal public lighting system. The Committee filed the petition, and indorsed it, "Inadvisable, at present."

The franchise of the Keokuk (Iowa) Gas Light and Coke Company has been extended for a period of 25 years. Among other pledges or concessions to the municipality, in consequence of the rights granted, the Company agrees not to charge a higher price to ordinary consumers for gas than the average price charged by the "different gas companies in the State of Iowa, and on the upper Mississippi river, above St. Louis, Mo." That it shall at all times keep the meters in order, free of expense to the consumer, excepting the rent of 25 cents per month for each meter. The quality of the gas is to be equal to the average standard required of other gas companies in Iowa and on the upper Mississippi. That on the reverse side, or at the foot of each bill presented to the consumer there shall be printed full directions for reading or ascertaining the state of the meter used by the Company at any time, and the Company shall, on application of any consumer, sell to the latter, at its actual cost to the Company, the meter through which he receives his gas supply. The Company, however, is to have the right, at all times, of proving the meters thus sold, and to retire them from use, if found incorrect. The Company also agrees to supply gas to the city, for use in the public buildings, etc., at a rate of 25 per cent. under that which it exacts from its ordinary customers.

The generating room of the Corsicana (Texas) gas works was recently the scene of a slight explosion. Although but little damage was done, the hands were thoroughly frightened. There was no interruption to the gas service.

The proprietors of the Clinton (Ia.) gas works will virtually rebuild that plant this season. A water gas process will be adopted, and several miles of new mains will be put down. A new gasholder will also be erected. Mr. S. M. Highlands has been appointed Superintendent.

The McKeesport (Pa.) Electric Light Company is enlarging its manufacturing capacity.

The Waco (Tex.) Gas and Electric Light Company has been furnishing the city with 33 arcs (2,000 candle), on the basis of a monthly payment of $12.50 per light, but the authorities, deeming the lighting insufficient, advertised for bids for 50 additional lamps. The Waco Electric Light and Railway Company submitted a tender of $11 per month per light, but its promoters were badly chagrined when they found that the Waco Gas Company signified its willingness to do the work at the rate of $9 per month per arc. The old Company was awarded the contract.

Advices from Crawfordsville, Ind., dated March 15th, are to the following effect: "The City Council of Crawfordsville was about to award the contract for the construction of an electric light plant, to be owned and operated by the city, when the proceedings were brought to an abrupt termination by an injunction, issued at the instance of Mr. Hector S. Braeden, a wealthy taxpayer, who protested against what he termed a misuse of the public moneys. The temporary injunction is to cover a period of 30 days, when judgment will be rendered as to whether it shall remain permanently. It is alleged that Mr. Braeden is acting on behalf of the Coffin and Stanton syndicate, of New York, who are the controllers of the local electric lighting supply."

The following are the rates paid in the named California cities for public arc lighting—the burning tables vary greatly, and can be partly estimated from the rates:

Benecia, $144; Folsom, $156.95; Napa, $166; Oakland, $105; Sacramento, $252; San Jose, $159.34; San Pedro, $273.75; San Rafael, $175; Santa Barbara, $166.50; Santa Rosa, $120; Stockton, $165; Woodland, $100.

The proprietors of the Frostburg (Md.) Gas Light Company have purchased, from Messrs. Thomas H. Paul & Sons, the right to use the Parker gas process in the town of Frostburg.

Mr. W. Littlehales, formerly in charge of the Barrie (Ontario) gas works, has been appointed Superintendent of the Gas Light Company of Galena, Ills.

The Davis and Farnam Manufacturing Company's Waltham shops present a very bustling appearance just now, and it looks that they will have soon to be enlarged. The iron for the New Britain (Conn.) Gas Company's new holder is about ready to ship, and the D. & F. Company are to be congratulated on the speed displayed in getting this work out.

On the 16th inst. the Committee on Manufacturers of the Massachusetts Legislature had a hearing on Senator Champlin's order which proposes to abolish the present Board of Gas and Electric Light Commissioners, replacing the same by a Board of Gas and Electric Light Control, the latter to have powers identical with those of the former. The change comes in respect to the qualifications of the Commissioners, the new measure directing that one of the Commissioners should be a gas engineer, another an electric light engineer, the third member to be an attorney-at-law. Champlin explained that his object was to secure a competent Board, in that he thought the existing Board was not possessed of sufficient technical knowledge, as it was composed of two lawyers and one merchant. He felt sure his audience would agree with him in the belief that two technical experts assisted by a lawyer would be more in keeping with the spirit that actuated the act than a Board without experts. The state of affairs at Chelsea—the presumable cause of the movement against the present Commission—was instanced as an example of what Senator

Champlin called the incompetency of the Commission—unimpassioned observers of the progress of events in Chelsea have, Mr. Senator, the impression that the conduct of the Chelsea affair affords an instance of the carefulness, capability and impartiality of the Commission—in that "they spent most of the hearing in trying to find out the facts from the experts, and otherwise showed their inability to take charge of the business intrusted to them." Having delivered his introductory, the Senator sank into the obscurity of an antique chair, to be followed in the argument by Prof. Gilley, of Chelsea, who also had a grievance against the Commission. Two years ago he applied to the Chelsea Gas Light Company for a supply of incandescent lights, but receiving no satisfaction as to the request, he petitioned for a hearing by the Commission under the act that gives to the Commission the power to compel a company to furnish electric light. He then gave a badly-mixed history of the hearing, and reverted to the action of the Commission at the sessions held for the purpose of showing that the Chelsea Company should be compelled to lower its gas rates. The Professor here allowed his passion to get a trifle the better of his coherency with a result something like the following: The Commissioners several times admitted their unfamiliarity with the subject of electric lighting, quoted passages from a prior annual report of the Commission as proof of their ignorance on matters electrical, and then gave his opinion of the respective technical merits of the Commissioners. He said that Chairman Coffin was a lawyer, was not a gas expert, did not know much about electricity, and did not show any particular fitness for the duties of the office. He thought Mr. Barker might know a trifle more about gas than Chairman Coffin did, but he did not believe Mr. Barker had made any thorough study of electricity. The third member (Mr. Towne), was a new appointee, and he (Gilley) had never heard him ask a question at the hearings. His principal qualfication (so far as known) seemed to be that he had been a grocer. The lack of experts on the Commission (remarked Prof. Gilley) would work injustice, especially to towns having differences with companies, when the experts would be all on one side. He did not consider the Commission competent to say whether a company was performing its duties with proper regard to the needs of the residents of cities, towns, etc. Gilley having exhausted his logic—and his wind—Representative Carter, of Wakefield, who also confessed to having nursed his wrath lest it should grow cold, arose with the explanation that Wakefield had a grievance. Summed up, it was this. The Commission granted an applying company the right to supply electric lighting to the residents after the Selectmen voted not to grant such right. Carter was followed by Mr. J. E. Addicks, who said he favored increasing the salaries of the present Commissioners, and also advocated the placing of two experts on the Board. He always found the position of the Commission was against the companies and in favor of the people; and that that inclination he thought sprang from a lack of thorough technical knowledge on the part of the Commission. He did not favor the proposition of Senator Champlin, because the present Commissioners were fast becoming expert, and that their knowledge of routine was excellent. Mr. Burrage said he did not appear against the present Commission, nor any member of it, but he did think an examination of the present statutes would show there was some need of a change in the constitution of the Board. The development of electrical science demanded a change, and believing that membership in the Commission should be based on technical knowledge, he accordingly favored an increase in the Commission by adding two experts—gas and electrical respectively—to it. The hearing was adjourned.

AGENT HUMPHREYS, of the Lawrence (Mass.) Gas Company, has offered to maintain public gas lamps in the adjoining hamlet of North Andover, at the rate of $18 per annum each, a moontable to be followed.

THE Stamford (Conn.) Company will this week take possession of their new offices in the Hoyt Building, corner of Atlantic and Luther streets.

THE hearing before the State Board, respecting the proposed reduction in gas rates at Boston, has been postponed to April 14.

MESSRS. HUBBARD, LEAVENWORTH AND HULL have been appointed a committee to represent the Wallingford (Conn.) Gas Company in any conference that may be had with the authorities respecting the purchase by the latter of the Company's plant.

THE new public lighting contracts at Buffalo, N. Y., are as follows: Arc lights (three Companies), at 40 cents each per night—2,000-candle power, all night and every night lighting. Gas lamps (three Companies), at $1.20 per 1,000 cubic feet; to light, extinguish, clean, and keep in repair, at 17 cents each lamp per month, the gas to have an illuminating power of 18 candles.

THE project is broached of building a gas works between the towns of Southport and Fairfield, Conn., supplying both from a common center. The plan is certainly feasible, and seems to have a fair promise of profit in it.

THE Eastern Companies have had a disastrous winter season in respect to damage to gas mains because of the severe and long continued frosts. Maine especially reports large losses from this source.

THE Circuit Court has affirmed the judgment of the lower Court in the case of Charles G. Jenner, a taxpayer, versus the village of Clifton, O., and others. The suit was brought to set aside a contract between the village authorities and the Cincinnati Gas Light and Coke Company, under which the latter was given the exclusive privilege of laying pipes in the streets of the village, and no provision made as to the price which should be paid for gas, except for the first ten years. The Common Pleas Court sustained a demurrer to the petition and the amended petition, and dismissed them both, and it is that action which is now affirmed.

A CORRESPONDENT at Doylestown, Pa., writes: "The popularity of incandescent electric light here is waning since the Company gave notice that the rate for same would have to be increased. One gentleman who has the lights in his place of business said he had been given notice that at the conclusion of the term of his contract with the Company his monthly rate would be increased from $7.50 to $10.80. 'I prefer the light to any other,' he said, 'but under the circumstances I'll have to dispense with it and return to gas, which is only half as dear compared with what my present bills will be, and a 44 per cent. increase is entirely too much.'"

Natural Gas in Iron Making.

Mr. W. F. Durfee, in *Popular Science Monthly*, says that among the more recent improvements in the manufacture of iron and steel, the use of gaseous fuel stands conspicuous. The idea of first converting the fuel into a combustible gas, and conveying this to the point where heat was required, and there igniting it, is a very old one, and, in one form or another, it has been employed over a thousand years; but it is only within the present century that the manifold advantages of gas as a metallurgical fuel have become fully recognized by the iron and steel workers of the world. The early gas furnaces used in Silesia, Sweden and other European countries, were but enlarged modifications of Geber's Tower of Athanor, and, although they were a great improvement on the furnaces in which solid fuel was burned on a grate, yet they were not able to produce a temperature sufficiently high and controllable to satisfy the demands of the rapidly developing iron and steel industries.

The gas furnace most commonly used in the American iron and steel industry was invented about 30 years ago by the brothers Frederick and Charles William Siemens, German engineers resident in London. The first Siemens furnace built in this country under the sanction of these inventors was erected at the works of John A. Griswold & Co., at Troy, N. Y., in 1867, and was used as a heating furnace. This was followed in the same year by a heating furnace at the works of the Nashua Iron and Steel Company, Nashua, N. H., and early in 1868 the first Siemens furnace for melting steel in crucibles (often called a "pot furnace") was started in the works of Anderson & Woods, at Pittsburgh. The first works in which the Siemens gas furnaces were used, to the exclusion of all other methods of burning fuel, were those of the American Silver Steel Company, at Bridgeport, Conn., which were erected in 1868–69. In these works were two puddling furnaces, three heating furnaces, one 24-pot melting furnace, a 24-pot muffle and ten gas producers, all on the Siemens principle. Gas from the producers was used under the boilers with entire success. At the time of the erection of these works they were the largest and most perfect plant of gas furnaces in America.

Natural gas has been known to the nations of the Old World for thousands of years. The Persian fire-worshippers used it for their sacred fire, and it has been used as a fuel in China since a time beyond the range of authentic history.

The earliest use of natural gas in this country was as an illuminant in the village of Fredonia, N. Y., in 1827, and it is still used there. The first person to use natural gas for manufacturing purposes is believed to have been Mr. William Tompkins, who, in 1842, employed it in the Kanawha Valley for heating the kettles of a salt block 100 feet in length. In 1845 Messrs. Dickerson and Shrewsbury bored a well on the Kanawha river, in West Virginia, to a depth of 1,000 feet, from which a sufficient quantity of gas issued, according to a computation by Prof. B. Silliman, Jr., "to light the city of New York for 12 years." The first use of natural gas for the manufacture of iron was in the Siberian Rolling Mill of Rogers & Burchfield, at Leechburg, Armstrong county, Pa., in 1874, 29 years after it had been successfully used under a salt block in West Virginia and 47 years after its first use for lighting at Fredonia, New York.

THE AMERICAN
GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.

This is a recognized official organ of
LIGHT, HEAT, STEAM, WATER SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 cents.

AGENTS.

NEW YORK.—AMERICAN NEWS CO., 39 and 41 Chambers Street.
Germany.—B. WESTERMANN & CO., of New York.

MONDAY, MARCH 23, 1891.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

MARCH 23.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	95½	95¾
Central	500,000	50	—	85
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	116	118
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	118	120
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	—	48
Preferred	5,000,000	100	—	90
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	118	120
Citizens	1,200,000	20	88	91
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	130	132
" Bonds	300,000		100	105
Peoples	1,000,000	10	91	92
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	100	105
" Bonds (5's)	70,000	—	—	—
Nassau	1,000,000	25	134	—
" Ctfs	700,000	1000	100	103
Williamsburgh	1,000,000	50	130	—
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	87½	88
2d " " "	3,000,000	1000	—	76
Bay State Gas Co.—				
Stock	5,000,000	50	54½	55
Income Bonds	2,000,000	1000	95½	—
Buffalo Mutual, N. Y.	750,000	100	105	110
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	—	—
Chicago Gas Company	25,000,000	100	41⅝	41¾
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	100	84¾	85½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	98
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	100
2d "	2,500,000	1000	94	98½
Consumers Gas Light Co., Jersey City	2,000,000	100	12	15
Bonds	600,000	1000	70	75
Cincinnati G. & C. Co.	6,500,000	100	204	205
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal			92	100
Capital, Sacramento, Cal			58	
Consolidated, Balt	11,000,000	100	47	47¾
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	110
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	102	108
Jersey City	750,000	20	165	170

Situation Wanted
As Superintendent of Gas Works,

By young man of several years' experience in same. Not particular as to size of works. Best of references. Address
824-2 "A. W.," care this Journal.

SITUATION WANTED
As Foreman of a Gas Works

By a thoroughly competent man Twenty years' experience in one place. Practical gasfitter, plumber, etc.; reasonable salary; faithful and intelligent work. Address "G. D. C.,"
1 464 Shannard St., Syracuse, N. Y.

WANTED.
A well-known and experienced Gas Engineer desires
Position as Superintendent or Manager of Coal or Water Gas Works.

Thoroughly familiar with details of construction and enlargement of plants; 14 years' experience. Would purchase interest in small works. Best references. Address
822-tf "S. A. C.," care this Journal.

POSITION DESIRED
As Superintendent of Gas Works,

By a young man fully experienced in the details of construction, manufacture, and distribution. Best of references. Address
814-tf "CONSTRUCTION," care this Journal.

WANTED,
Second-Hand Roots Exhauster, No. 3.

With Valves and 6-inch Connections, in good order. Address
817-13 "EXHAUSTER," care this Journal.

Proposals for Street Lighting.

SEALED BIDS will be received at this Office, up to 12 o'clock, April 2, 1891, for the furnishing, lighting, cleaning, repairing and keeping in repair **Seven Hundred Gasoline Street Lamps,** more or less, for a term of four years. Said lamps to be of latest design, frames to be painted, and when damaged in any way to be repaired at once; the glass to be kept clean and bright at all times. Lamps to be lighted at sunset and kept constantly burning until daylight every night in the year. The right is reserved to order the re-location of lamps from time to time, as the City Gas Inspector may direct. Bidders will be required to exhibit to the Gas Committee of the City Council, three days prior to the opening of bids, samples of lamps, posts and burners they propose to furnish. All bids must be accompanied by a certified check of $500, and the successful bidder will be required to give a bond in the sum of $5,000 for the faithful performance of the contract. The right is reserved to reject any or all bids. C. S. GOODRICH,
OMAHA, NEBRASKA. City Comptroller.

FOR SALE,

One Air Condenser, 500,000 feet capacity.
One Multitubular Condenser, 500,000 feet capacity.
One Anderson Tar Extractor, 500,000 feet capacity.
Ten 12-inch Chapman Valves.
One Station Meter (Tufts'), 40,000 feet capacity.
Seventy-Five 12-inch by 20-inch Mouthpieces, with Balmore's Self-Sealing Lids.

All in good order. Address NEW HAVEN GAS LT. CO.,
819-tf New Haven, Conn.

DURAND WOODMAN, Ph.D.,
Analytic and Technical
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Analyses of Gas, Fuel and Gas Coals, Crude and Refined Petroleum, Materials for Gas Purification, Tar, Ammoniacal Liquors and other Bye-Products. Fire Clays, Deposits in Mains, Water for Steam Making, Boiler Scale, etc., etc. Expert work in connection with "Damages to adjacent water supplies and adjoining properties." Experimental Investigations for Inventors.
127 Pearl Street (Hanover Square), N. Y.

The American Gas, Light & Heat Co.,
OF
249 S. 6th St., Phila., Pa.,

Are now prepared to erect plants of their Oxy-Hydrocarbon Process, to carburet coal gas up to any given or named candle power required for general consumption (for instance, from 20 to 25 candles), and at a cost not to exceed one and three-quarters (1¾) cents per candle power per 1,000 cubic feet increased, with a permanent and perfectly *fixed* gas, *not a vapor*—a gas that will whiten the whole output of the works.

This gas can be furnished at a cost less per 1,000 cubic feet than the coal gas may be costing the company.

Our system is such that we can furnish plants that will carburet 50,000 cubic feet in 24 hours, or three or four million feet in the same length of time. *One* of our large benches or plants would be capable of generating 100,000 cubic feet of gas in 24 hours, which would raise the candle power on 2,000,000 feet (taking as a standard coal gas at 15 candles) 3 candles on the 2,000,000 feet, enabling the works to deliver to consumers an 18 candle gas; or, enlarging our plant, the candle power may be increased as desired, at the same cost per candle power, less interest on plant.

This is much less per candle power than it can be furnished by the use of cannel coal or by vaporizing naphtha. With our process we improve the whole output in color—viz., whiten the flame with the oxygen, as well as furnishing a *thoroughly fixed* gas, and no possible danger of separation as there is with vapor. Correspondence solicited.

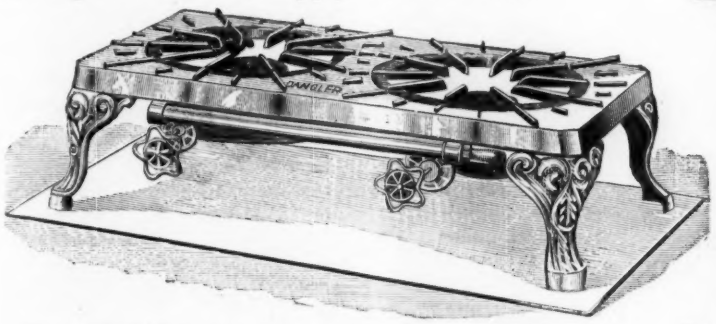
J. J. NEWELL, Sec'y.
September 4, 1890.

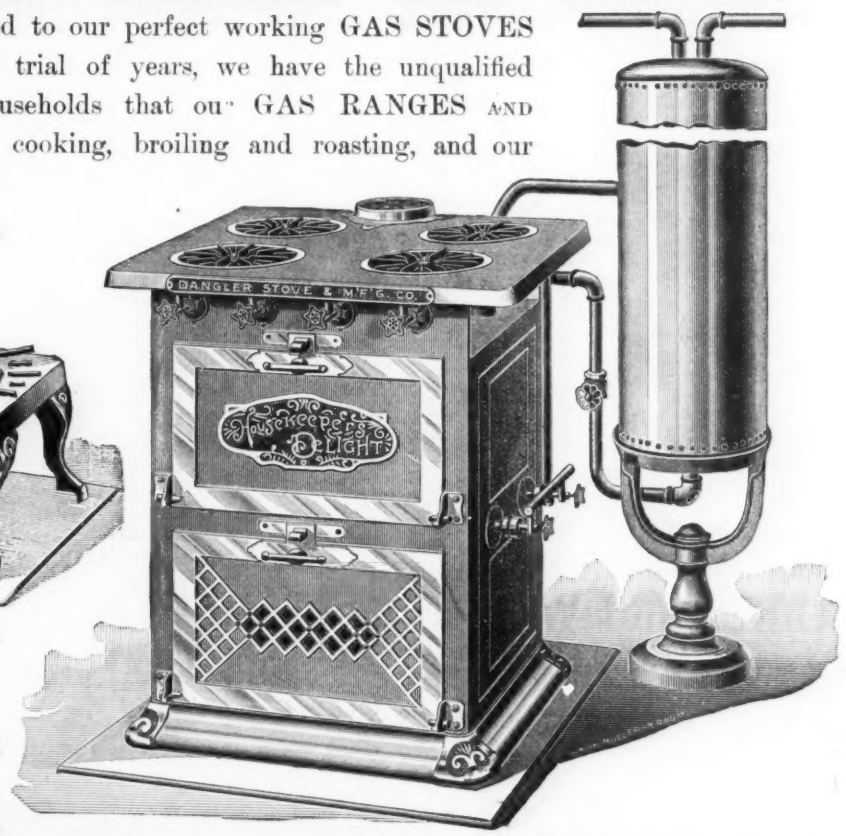
THE DANGLER GAS RANGES AND STOVES.

In calling the attention of those interested to our perfect working GAS STOVES AND RANGES, after a thorough and rigid trial of years, we have the unqualified assurance from the heads of over 6,000 households that our GAS RANGES AND STOVES are a perfect success for baking, cooking, broiling and roasting, and our

HOT WATER DEVICE

is a marvel of convenience and economy, furnishing an unfailing supply of hot water.





Our line includes all the different styles of Ranges and Stoves, and we call special attention to our

Hot Plates,

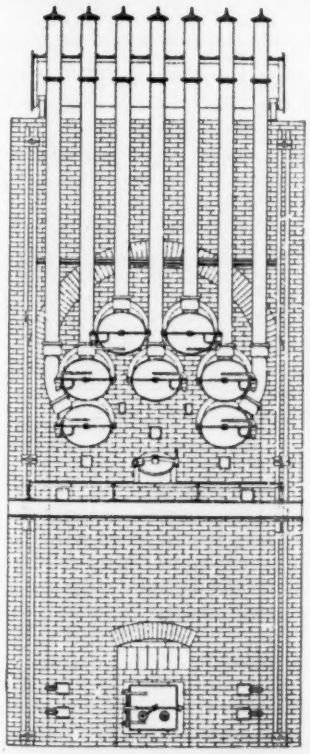
which are especially popular on account of the size and style, and finished either in nickel or polished iron.

We invite correspondence and send Catalogues on application.

THE DANGLER STOVE AND MANUFACTURING CO., Cleveland, O.

LACLEDE FIRE BRICK MANUFACTURING COMPANY,

ST. LOUIS, MO.



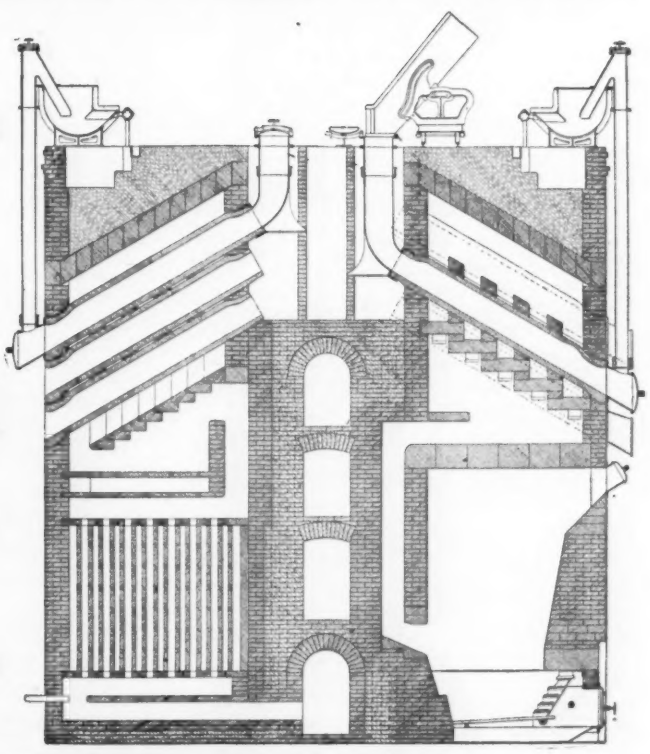
Exclusive Agents in the United States

FOR THE

Coze System of Inclined Retorts.

IT IS THE COMING BENCH FOR MAKING COAL GAS.

It will Save from 50 to 60 per ct. in Labor.



ESTIMATES AND PLANS FURNISHED BY THE

LACLEDE FIRE BRICK MFG. CO., ST. LOUIS, MO.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.

This is a recognized official organ of
LIGHT, HEAT, STEAM, WATER SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 cents.

AGENTS.

NEW YORK.—AMERICAN NEWS CO., 39 and 41 Chambers Street.
Germany.—B. WESTERMANN & CO., of New York.

MONDAY, MARCH 23, 1891.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

MARCH 23.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	95½	95¾
Central	500,000	50	—	85
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	116	118
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	118	120
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	—	48
Preferred	5,000,000	100	—	90
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	118	120
Citizens	1,200,000	20	88	91
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	130	132
" Bonds	300,000		100	105
Peoples	1,000,000	10	91	92
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	100	105
" Bonds (5's)	70,000	—	—	—
Nassau	1,000,000	25	134	—
" Ctfs	700,000	1000	100	103
Williamsburgh	1,000,000	50	130	—
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	87½	88
2d " " "	3,000,000	1000	—	76
Bay State Gas Co.—				
Stock	5,000,000	50	54½	55
Income Bonds	2,000,000	1000	95½	—
Buffalo Mutual, N. Y.	750,000	100	105	110
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	—	—
Chicago Gas Company	25,000,000	100	41⅝	41¾
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	100	84¾	85½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	98
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	100
2d "	2,500,000	1000	94	98½
Consumers Gas Light Co., Jersey City	2,000,000	100	12	15
Bonds	600,000	1000	70	75
Cincinnati G. & C. Co.	6,500,000	100	204	205
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal			92	100
Capital, Sacramento, Cal			58	
Consolidated, Balt	11,000,000	100	47	47¾
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	110
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	102	108
Jersey City	750,000	20	165	170

Situation Wanted
As Superintendent of Gas Works,

By young man of several years' experience in same. Not particular as to size of works. Best of references. Address
824-2 "A. W.," care this Journal.

SITUATION WANTED
As Foreman of a Gas Works

By a thoroughly competent man Twenty years' experience in one place. Practical gasfitter, plumber, etc.; reasonable salary; faithful and intelligent work. Address "G. D. C.,"
1 464 Shannard St., Syracuse, N. Y.

WANTED.
A well-known and experienced Gas Engineer desires
Position as Superintendent or Manager of Coal or Water Gas Works.

Thoroughly familiar with details of construction and enlargement of plants; 14 years' experience. Would purchase interest in small works. Best references. Address
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POSITION DESIRED
As Superintendent of Gas Works,

By a young man fully experienced in the details of construction, manufacture, and distribution. Best of references. Address
814-tf "CONSTRUCTION," care this Journal.

WANTED,
Second-Hand Roots Exhauster, No. 3.

With Valves and 6-inch Connections, in good order. Address
817-13 "EXHAUSTER," care this Journal.

Proposals for Street Lighting.

SEALED BIDS will be received at this Office, up to 12 o'clock, April 2, 1891, for the furnishing, lighting, cleaning, repairing and keeping in repair **Seven Hundred Gasoline Street Lamps**, more or less, for a term of four years. Said lamps to be of latest design, frames to be painted, and when damaged in any way to be repaired at once; the glass to be kept clean and bright at all times Lamps to be lighted at sunset and kept constantly burning until daylight every night in the year. The right is reserved to order the re-location of lamps from time to time, as the City Gas Inspector may direct. Bidders will be required to exhibit to the Gas Committee of the City Council, three days prior to the opening of bids, samples of lamps, posts and burners they propose to furnish. All bids must be accompanied by a certified check of $500, and the successful bidder will be required to give a bond in the sum of $5,000 for the faithful performance of the contract. The right is reserved to reject any or all bids. C. S. GOODRICH,
OMAHA, NEBRASKA. City Comptroller.

FOR SALE,

One Air Condenser, 500,000 feet capacity.
One Multitubular Condenser, 500,000 feet capacity.
One Anderson Tar Extractor, 500,000 feet capacity.
Ten 12-inch Chapman Valves.
One Station Meter (Tufts'), 40,000 feet capacity.
Seventy-Five 12-inch by 20-inch Mouthpieces, with Balmore's Self-Sealing Lids.
All in good order. Address NEW HAVEN GAS LT. CO.,
819-tf New Haven, Conn.

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Analyses of Gas, Fuel and Gas Coals, Crude and Refined Petroleum, Materials for Gas Purification, Tar, Ammoniacal Liquors and other Bye-Products, Fire Clays, Deposits in Mains, Water for Steam Making, Boiler Scale, etc., etc. Expert work in connection with "Damages to adjacent water supplies and adjoining properties." Experimental Investigations for Inventors.
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OF
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Are now prepared to erect plants of their Oxy-Hydrocarbon Process, to carburet coal gas up to any given or named candle power required for general consumption (for instance, from 20 to 25 candles), and at a cost not to exceed one and three-quarters (1¾) cents per candle power per 1,000 cubic feet increased, with a permanent and perfectly *fixed* gas, *not a vapor*—a gas that will whiten the whole output of the works.

This gas can be furnished at a cost less per 1,000 cubic feet than the coal gas may be costing the company.

Our system is such that we can furnish plants that will carburet 50,000 cubic feet in 24 hours, or three or four million feet in the same length of time. *One* of our large benches or plants would be capable of generating 100,000 cubic feet of gas in 24 hours, which would raise the candle power on 2,000,000 feet (taking as a standard coal gas at 15 candles) 3 candles on the 2,000,000 feet, enabling the works to deliver to consumers an 18 candle gas; or, enlarging our plant, the candle power may be increased as desired, at the same cost per candle power, less interest on plant.

This is much less per candle power than it can be furnished by the use of cannel coal or by vaporizing naphtha. With our process we improve the whole output in color—viz., whiten the flame with the oxygen, as well as furnishing a *thoroughly fixed* gas, and no possible danger of separation as there is with vapor. Correspondence solicited.

J. J. NEWELL, Sec'y.
September 4, 1890.

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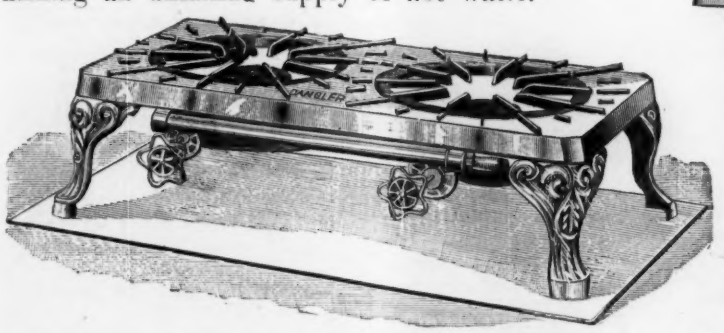
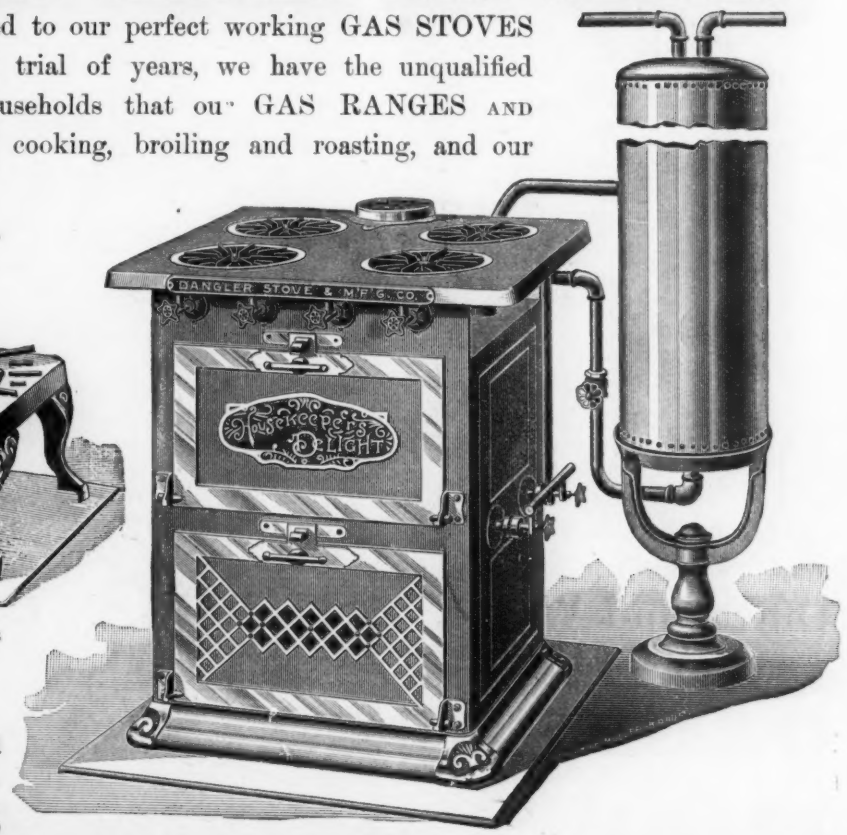
HOT WATER DEVICE

is a marvel of convenience and economy, furnishing an unfailing supply of hot water.





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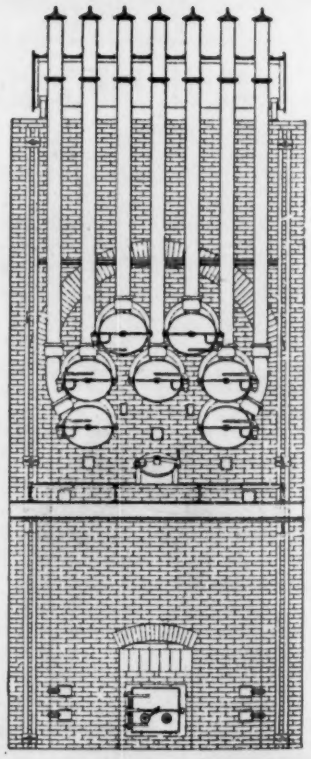

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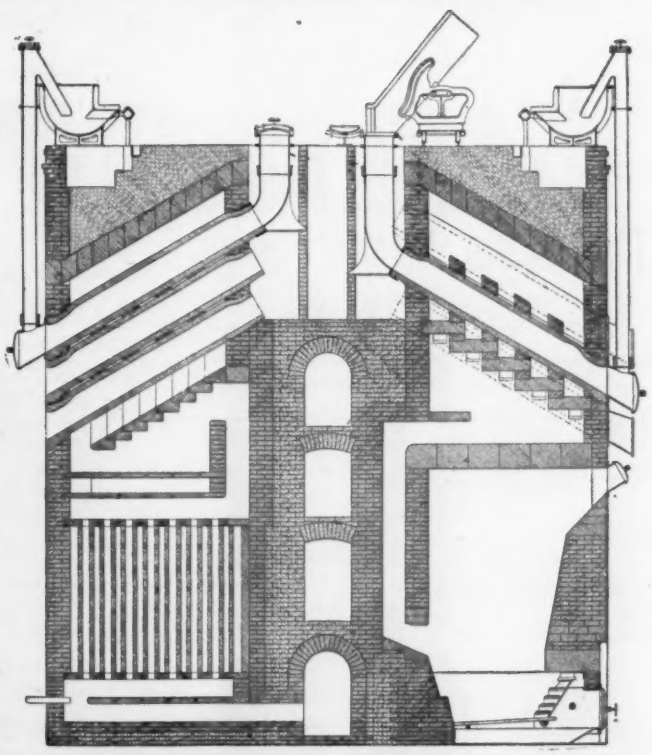
It will Save from 50 to 60 per ct. in Labor.



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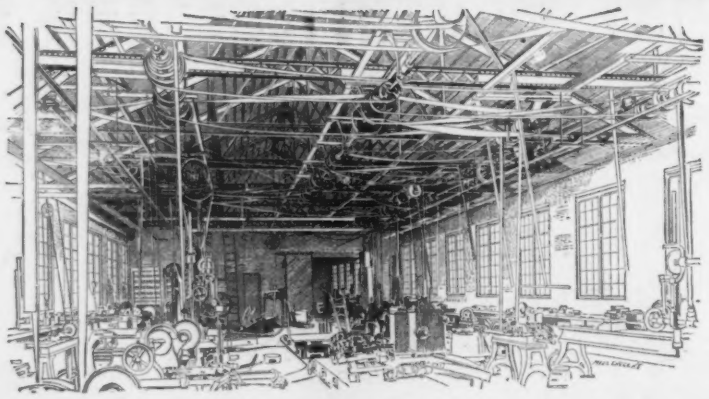

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Bartlett Street Lamp Mfg. Co.

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Globe Lamps,

FOR

Streets, Parks, Public Buildings, Railroad Stations, etc.

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A Specialty.

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By E. J. MILLS, D.Sc F.R.S., and F. J. ROWAN, C.E., assisted by others, including Mr. F. P. Dewey, of the Smithsonian Inst., Wash., D. C.

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SUPPLIES

Of all kinds for Gas, Steam, Water and Oil.

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GOVERNOR BURNERS

for

STREET LAMPS AND GENERAL USE,

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GOVERNORS FOR ARGAND AND OTHER COMMON GAS BURNERS IN ALL SIZES.

HORIZONTAL

Governors

Specially adapted for GAS STOVES, FURNACES, Etc., Etc.

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Correspondence Solicited with all who require a Reliable Governor.

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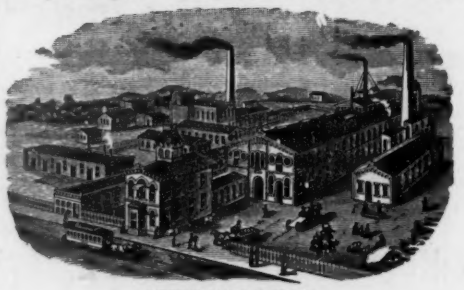

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Send for Circulars.

Valves.—Double and Single Gate, ¾ in. to 48 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam, and Oil. Send for Circulars.

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MANUFACTURED SOLELY BY

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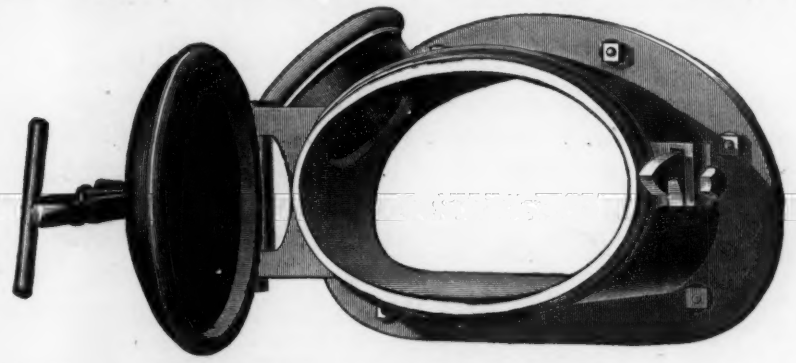
THOS. F. ROWLAND, President.

Take 10th or 23d Street Ferries from New York to Greenpoint. **BROOKLYN, N. Y.**

Made for Round, Oval, or "D" Retorts.



Joint made under the well-known Balmore Patent

This Mouthpiece and Lid was introduced to the public in 1884, and since then large numbers have been manufactured and sold.

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Extracts the Whole of the Ammonia and a Large Percentage of the Sulphureted Hydrogen and Carbonic Acid.

MINIMUM WEIGHT IN MOTION • MINIMUM DRIVING POWER • MINIMUM BACK PRESSURE • MINIMUM WEAR AND TEAR • WITH MAXIMUM RESULTS.

The "New" Washer-Scrubber, with Wooden "Bundles," has been for many months in successful operation at the London Gas Light and Coke Company's station at Beckton, and at many other European Gas Works The "Bundles" can be supplied to "Standard" Washer-Scrubbers already in use.

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Water Gas! Fuel Gas!

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THE LOOMIS PROCESS.

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WE ALSO MAKE THE CHEAPEST AND STRONGEST REVERSIBLE BOLTED TRAYS IN THE MARKET.

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MANUFACTURERS OF ALL KINDS OF

Gas Cooking and Heating APPLIANCES.

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GAS GOVERNORS,

Gas Balance.

JEWEL GAS STOVES

MANUFACTURED BY

GEORGE M. CLARK & COMPANY,

157 & 159 Superior Street, - Chicago, Ill.

EVERY CONCEIVABLE SIZE AND STYLE.

Ranging in Prices from $1.50 to $37.00.

WE USE NO GAS COCKS.

All Flames are Regulated by a Direct Needle Valve.

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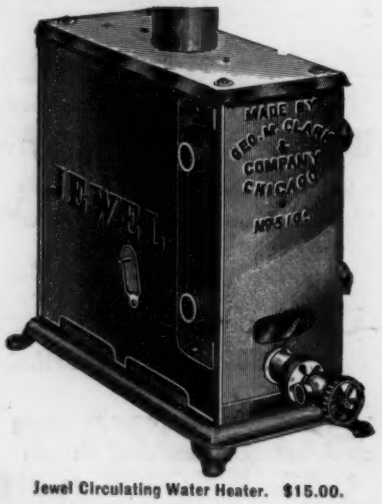
IS THE

Only Well-Made Gas Stove on the Market.

Write for our 1890 Catalogue and see for yourself.



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Standard 3 Diaphragm Dry Meter.

Gas Meters,

STATION METERS,

METER PROVERS, PHOTOMETERS,

Experimental Meters of all Kinds,

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Standard 2 Diaphragm Dry Meter.

Apparatus for Testing the Quantity and Quality of Gases.

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GAS STOVE SHOW ROOMS, No. 242 Sixth Avenue, New York City.

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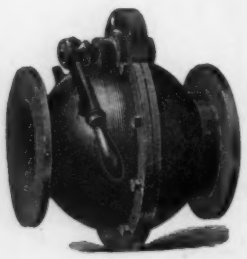
GAS AND BYE-PASS VALVES.



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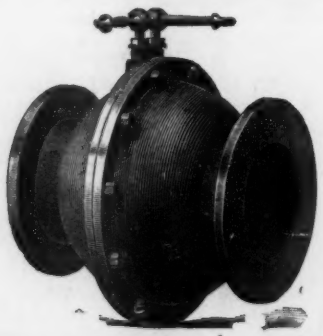
Quick Acting,
Simple,
Efficient, Durable.



BYE-PASS VALVE.

Automatic Action
Reliable
Simple Durable.

Thousands now in use and giving perfect satisfaction. Write for Catalogue and Prices.

ROOTS'
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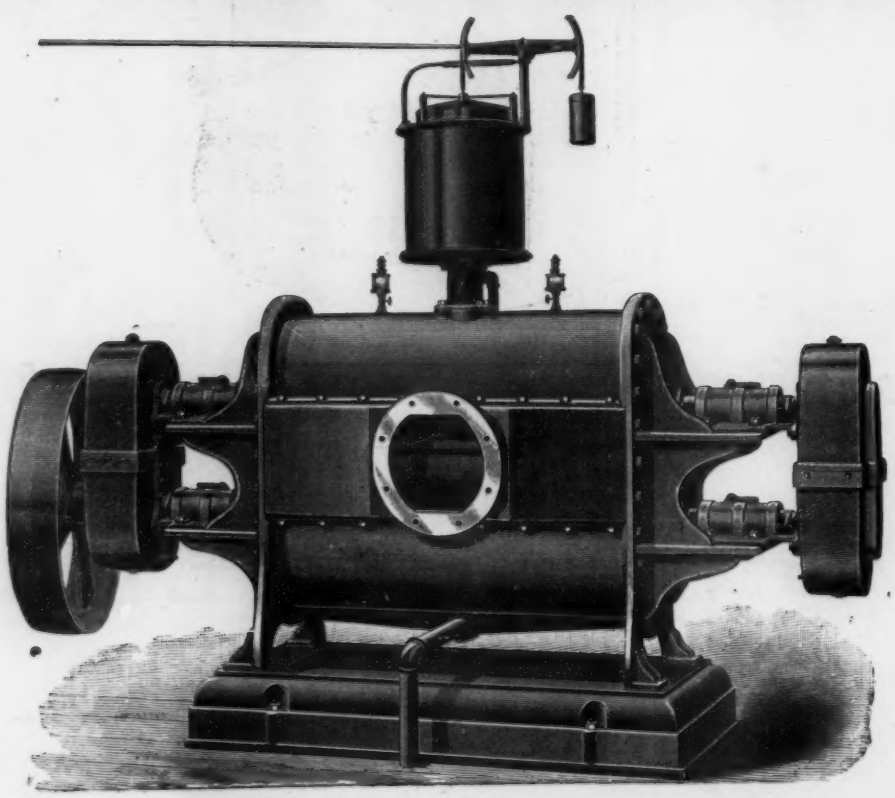

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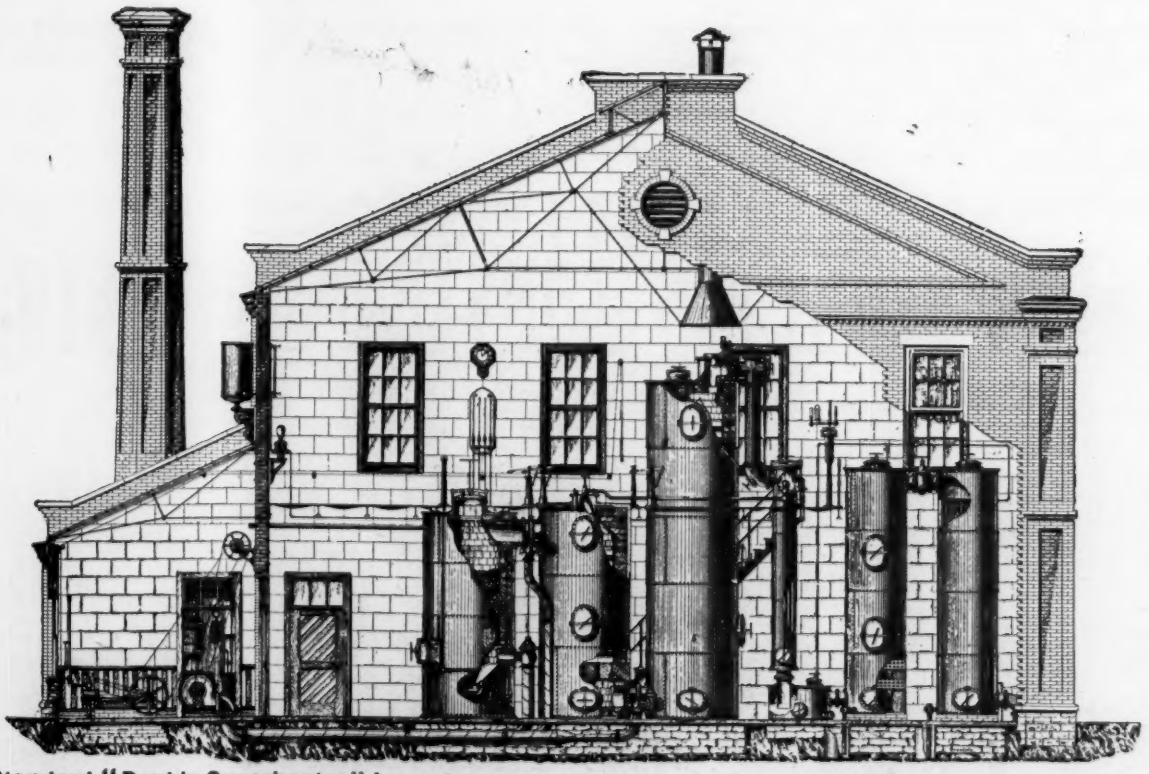

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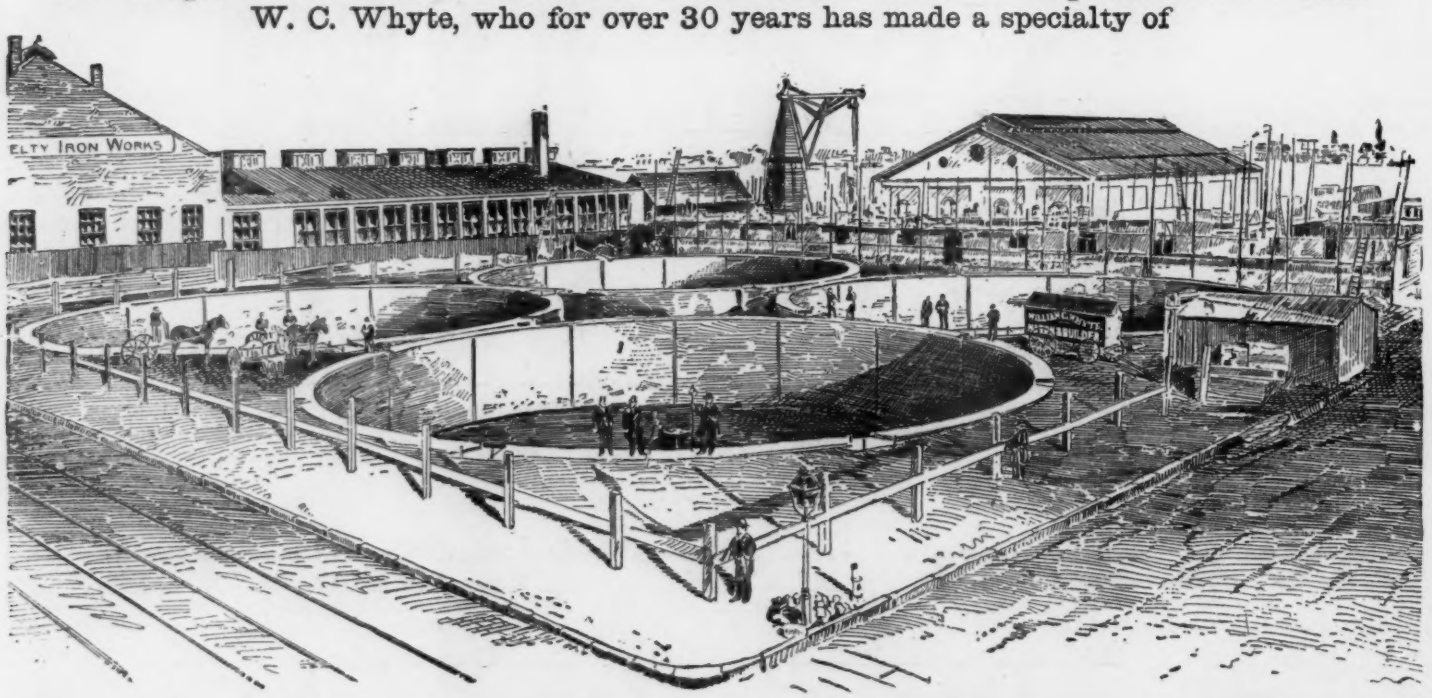

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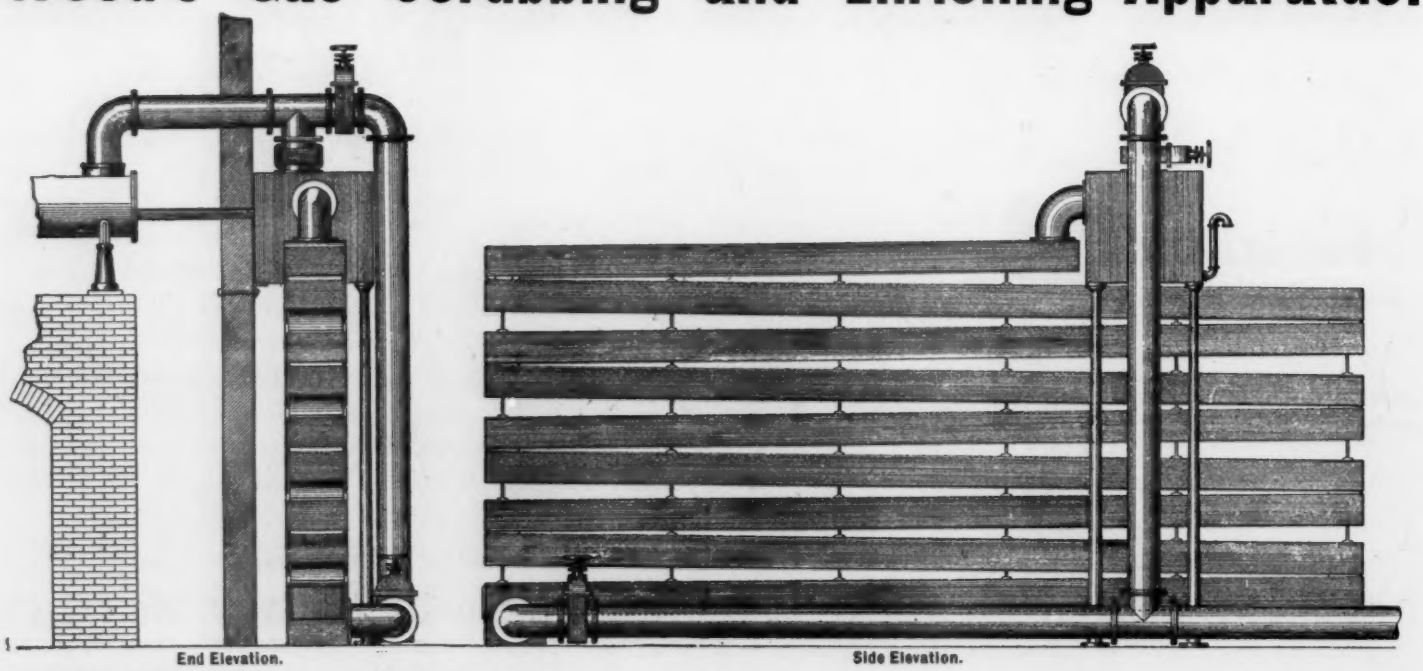

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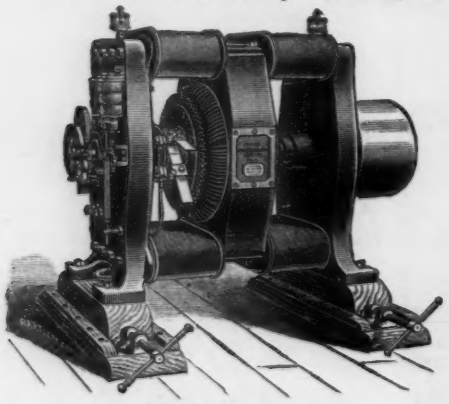

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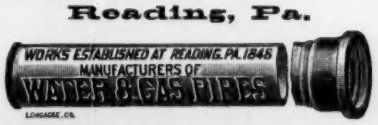

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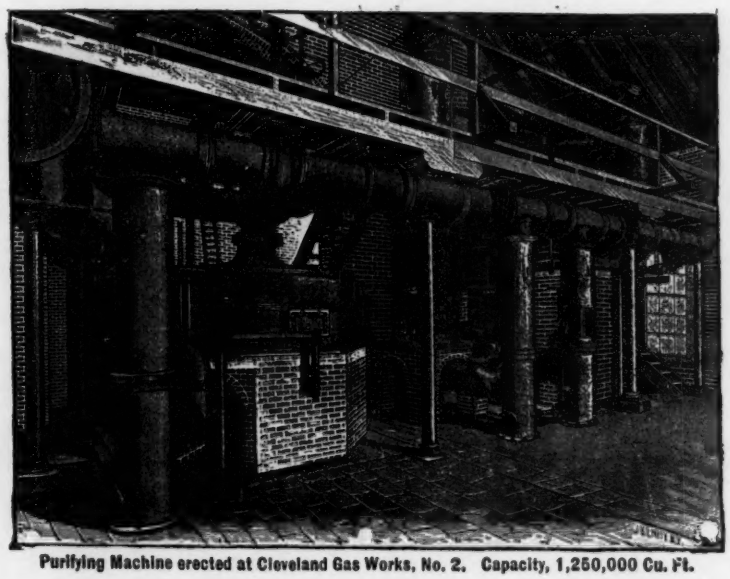

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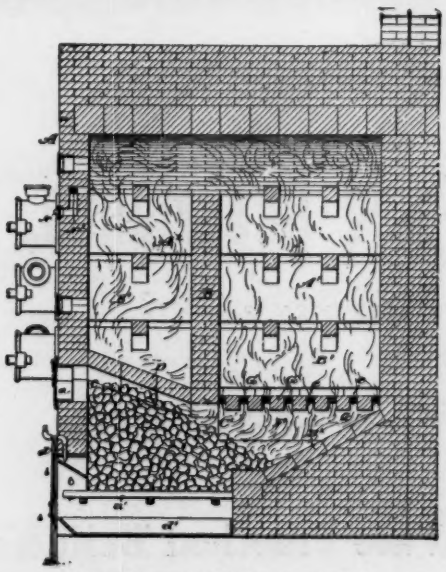

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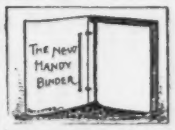

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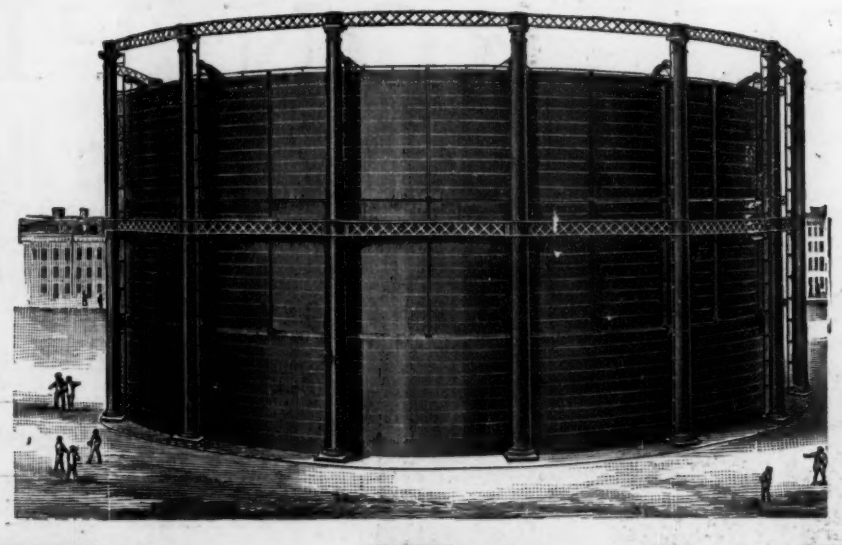

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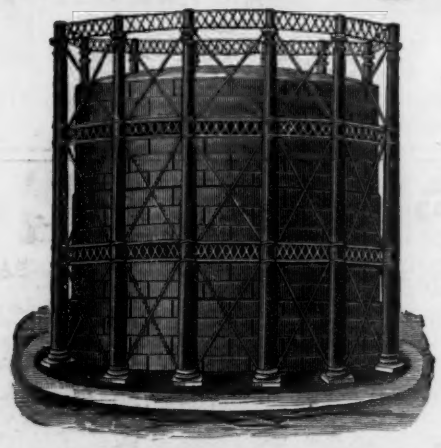

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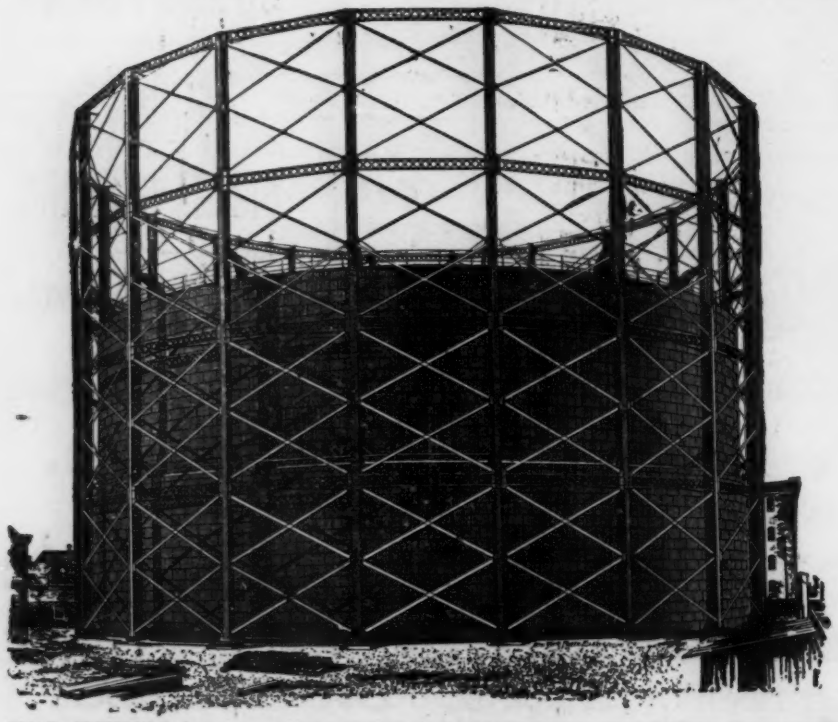

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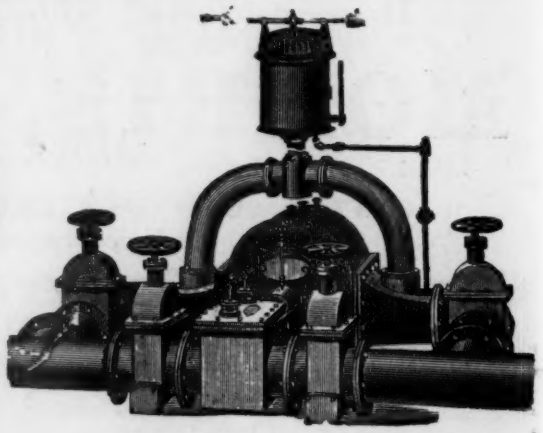

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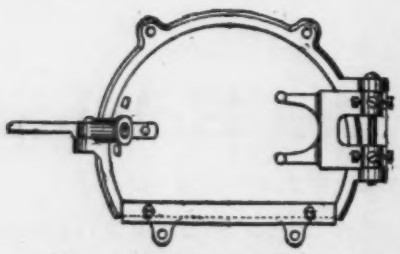

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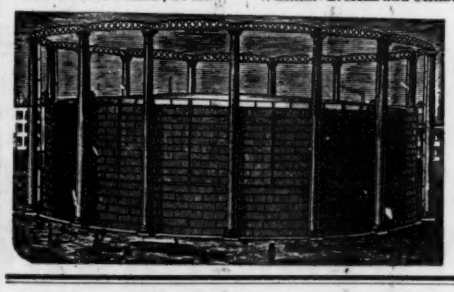
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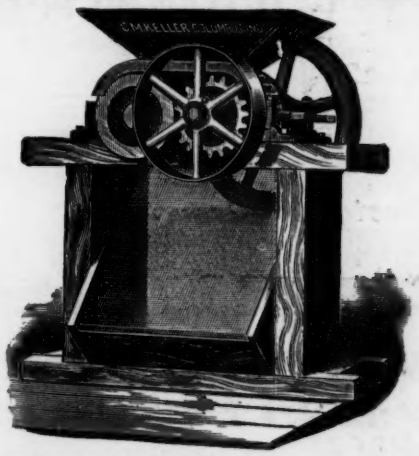

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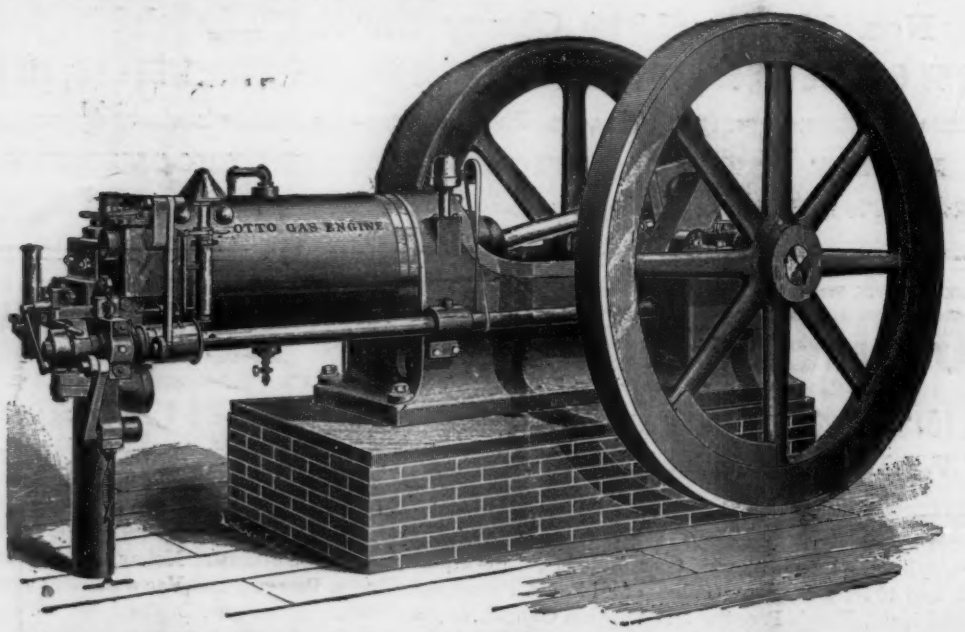

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